

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As the below named inventor, I hereby declare that:

My residence, post office address and citizenship is as stated below next to my name;

I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

NUCLEIC ACIDS AND PROTEINS FROM GROUP B STREPTOCOCCUS

the specification of which: is attached hereto.

was filed on: _____

as Application No.: _____

and was amended on: _____ (if applicable).

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. § 1.56.

And I hereby authorize and request our agents, Brobeck, Phleger & Harrison LLP, whose address is set forth below, to insert above, the filing date and application number of said application when known.

Prior Foreign Application(s)

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Country	Application Number	Date of Filing (day, month, year)	Date of Issue (day, month, year)	Priority Claimed	
German	9816335.5	July 27, 1998		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
				Yes <input type="checkbox"/>	No <input type="checkbox"/>

Prior Provisional Application(s)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

Application Number	Date of Filing (day, month, year)
60/125,163	March 19, 1999

Prior United States Application(s)

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Number	Date of Filing (day, month, year)	Status - Patented, Pending, Abandoned
PCT/GB99/02444	27 July 1999	Pending

And I hereby appoint, both jointly and severally, as my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith the following attorneys, their registration numbers being listed after their names:

Rodger L. Tate, Registration No. 27,399; Anthony W. Shaw, Registration No. 30,104; James Remenick, Registration No. 36,902; Michael J. Songer, Reg. No. 39,841; Cono A. Carrano, Registration No. 39,623; Laurence H. Posorske, Registration No. 34,698; Floyd B. Chapman, Registration No. 40,555; David J. Kulik, Registration No. 36,576; Robert A. King, Registration No. 42,738; and Trevor Q. Coddington, Registration No. 46,633.

All correspondence and telephone communications should be addressed to: Brobeck, Phleger & Harrison LLP; Intellectual Property Department; 1333 H Street, N.W.; Suite 800; Washington, DC 20005; telephone number (202) 220-6000; facsimile number (202) 220-5200, which is also the address, telephone and facsimile numbers of each of the above listed attorneys.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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Signature _____ Date _____

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Residence: Cambridge, United Kingdom

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Signature _____ Date _____

Full Name of Second Inventor: WELLS Jeremy Mark
(Family Name) (First Given Name) (Second Given Name)

Citizenship: United Kingdom

Residence: Norwich, United Kingdom

Post Office Address: c/o Institute of Food Research, Norwich Laboratory, Norwich Research Park
Colney, Norwich NR4 7UA, United Kingdom

Signature _____ Date _____

Full Name of Third Inventor: HANNIFFY Sean Bosco
(Family Name) (First Given Name) (Second Given Name)

Citizenship: Ireland

Residence: Cambridge, United Kingdom

Post Office Address: c/o University of Cambridge, Department of Pathology, Tennis Court Road
Cambridge CB2 1QP, United Kingdom

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
)
Christophe Francois Guy GILBERT et al.) Group Art Unit: To Be Assigned
)
Application Number: To Be Assigned) Examiner: To Be Assigned
)
Filed: January 26, 2001)
)
For: NUCLEIC ACIDS AND PROTEINS FROM GROUP B STREPTOCOCCUS

SUBMISSION OF SEQUENCE LISTING

Commissioner for Patents
Washington, D.C. 20231

Sir:

Applicants submit herewith a paper copy of the Sequence Listing as filed in parent application number PCT/GB99/02444 filed July 27, 1999. The Sequence Listing in this application is identical to the Sequence Listing submitted in the parent application.

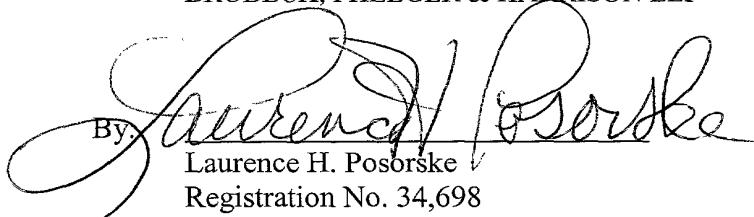
Applicants respectfully submit that it is unnecessary to file a computer readable form of the Sequence Listing, since it would be a duplicate of the computer readable form submitted in parent application number PCT/GB99/02444. Therefore, in accordance with 37 C.F.R. §1.821(e), no computer readable form is enclosed.

Applicants herewith request that the computer readable form submitted in parent application number PCT/GB99/02444 be used in this application. The undersigned certifies his belief that the computer readable form submitted in the parent application is identical in content to the paper copy of the Sequence Listing enclosed herewith.

It is believed that no fees are required for this submission; however, the Commissioner is authorized to charge any fee necessary for entry of this paper to Deposit Account 50-1640.

Respectfully submitted,

BROBECK, PHLEGER & HARRISON LLP


By:
Laurence H. Posorske
Registration No. 34,698

January 26, 2001

Brobeck, Phleger & Harrison LLP
Intellectual Property Department
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Washington, D.C. 20005
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SEQUENCE LISTING

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Le Page, Richard WF

Wells, Jeremy M

Hanniffy, Sean B

Hansbro, Philip M

<120> Proteins

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<140> PCT/GB99/02452

<141> 1999-07-27

<150> GB 9816336.3

<151> 1998-07-27

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<213> Streptococcus pneumoniae

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<213> Streptococcus pneumoniae

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25

30

Gly Ile Ser Val Gly Ile Gly His Leu Gln Gly Ser Ser Met Ala Lys

35

40

45

Asn Asn Lys Val Ala Val Val Thr Thr Val Pro Ser Val Ala Glu Gly

50

55

60

Leu Lys Asn Val Asn Gly Val Asn Phe Asp Tyr Lys Asp Glu Ala Ser

65

70

75

80

Ala Lys Glu Ala Ile Lys Glu Glu Lys Leu Lys Gly Tyr Leu Thr Ile
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Asp Gln Glu Asp Ser Val Leu Lys Ala Val Tyr His Gly Glu Thr Ser
100 105 110

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145 150 155 160

Lys Glu Asn Lys Lys Phe Ile Gln Thr Ile Ala Ala Gly Ala Leu Gly
165 170 175

Phe Phe Leu Tyr Met Ile Leu Ile Thr Tyr Ala Gly Val Thr Ala Gln
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Ser Ile Arg Ala Ser His Tyr Phe Tyr Ala Arg Met Met Ala Leu Phe
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Ile Leu Ile Met Gly Gly Phe Phe Gly Val Thr Ala Leu Gly Ala Ala
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Gly Asp Asn Leu Leu Leu Lys Ile Gly Ser Tyr Ile Pro Phe Ile Ser
 325 330 335

Thr Phe Phe Met Pro Phe Arg Thr Ile Asn Asp Tyr Ala Gly Gly Ala
 340 345 350

Glu Ala Trp Ile Ser Leu Ala Ile Thr Val Ile Phe Ala Val Val Ala
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Gly Asp Leu Ile Leu Lys Ile Asp Ala His Ser Lys Val Thr Glu Thr
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145 150 155 160

Thr Leu His Leu Val Glu Glu Asn Met Phe Gly Ser Ser Ile Ala Asn
165 170 175

Tyr Arg Asn Ser Ser Glu Asp Arg Tyr Val Ser Ser Ile Phe His Gly
180 185 190

Met Tyr Lys Arg Glu Val Phe Gln Lys Val Gly Leu Val Asn Glu Gln
195 200 205

Leu Gly Arg Thr Glu Asp Asn Asp Ile His Tyr Arg Ile Arg Glu Tyr
210 215 220

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225 230 235 240

Arg Pro Thr Phe Lys Lys Met Leu His Gln Lys Tyr Ser Asn Gly Leu
245 250 255

Trp Ile Gly Leu Thr Ser His Val Gln Phe Lys Cys Leu Ser Leu Phe
260 265 270

His Tyr Val Pro Cys Leu Phe Val Leu Ser Leu Val Phe Ser Leu Ala
275 280 285

Leu Leu Pro Ile Thr Phe Val Phe Ile Thr Leu Leu Leu Gly Ala Tyr
290 295 300

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305 310 315 320

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Lys Asp Tyr Arg Glu Ile Ile Leu Ser Gln Asp Val Leu Glu Val
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Val Ser Asp Leu Lys Leu Asp Leu Thr Pro Lys Gly Leu Ala Asn Lys
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Ile Lys Val Thr Val Pro Val Asp Thr Arg Ile Val Ser Ile Ser Val
115 120 125

Asn Asp Arg Val Pro Glu Glu Ala Ser Arg Ile Ala Asn Ser Leu Arg
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Glu Val Ala Ala Gln Lys Ile Ile Ser Ile Thr Arg Val Ser Asp Val
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Thr Thr Leu Glu Glu Ala Arg Pro Ala Ile Ser Pro Ser Ser Pro Asn
165 170 175

Ile Lys Arg Asn Thr Leu Ile Gly Phe Leu Ala Gly Val Ile Gly Thr
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Ser Val Ile Val Leu His Leu Glu Leu Leu Asp Thr Arg Val Lys Arg
195 200 205

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35 40 45

Arg Ala Asp His Val Phe Asp Gly Asp Leu Ser Asp Tyr Asp Met Ile
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Val Leu Pro Gly Gly Met Pro Gly Ser Ala His Leu Arg Asp Asn Gln
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Thr Leu Ile Gln Glu Leu Gln Ser Phe Glu Gln Glu Gly Lys Lys Leu
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Ala Ala Ile Cys Ala Ala Pro Ile Ala Leu Asn Gln Ala Glu Ile Leu
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Val Arg Leu Ser Gly Leu Val Asn Arg Glu Leu Leu Asn Pro Lys
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His Pro Ala Pro Glu Leu Leu Asn Leu Ala Arg Phe Val Lys Arg Glu
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Gly Lys Glu Val Glu Asn Leu Glu Ile Thr Leu His Gln His Thr Leu
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Thr Ile Thr Asp Ser Phe Asp Asp Gln Ile His Ile Ser Tyr His Pro
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Ser Leu Ser Ala His His Asp Leu Ile Thr Asn Gln Asn Asp Arg Thr
100 105 110

Leu Ser Leu Thr Asp Lys Lys Leu Ser Glu Thr Pro Phe Leu Ser Ser
115 120 125

Gly Ile Gly Gly Ile Leu His Ile Ala Ser Ser Tyr Ser Ser Arg Phe
130 135 140

Glu Glu Val Ile Leu Arg Leu Pro Lys Gly Arg Thr Leu Lys Gly Ile
145 150 155 160

Asn Ile Ser Ala Asn Arg Gly Gln Thr Thr Ile Ile Asn Ala Ser Leu
165 170 175

Glu Asn Ala Thr Leu Asn Thr Asn Ser Tyr Ile Leu Arg Ile Glu Gly
180 185 190

Ser Arg Ile Lys Asn Ser Lys Leu Thr Thr Pro Asn Ile Val Asn Ile
195 200 205

Phe Asp Thr Val Leu Thr Asp Ser Gln Leu Glu Ser Thr Glu Asn His
210 215 220

Phe His Ala Glu Asn Ile Gln Val His Gly Lys Val Glu Leu Thr Ala
225 230 235 240

Lys Asp Tyr Leu Arg Ile Ile Leu Asp Gln Lys Glu Ser Gln Arg Ile
245 250 255

Asn Trp Asp Ile Ser Ser Asn Tyr Gly Ser Ile Phe Gln Phe Thr Arg
260 265 270

Glu Lys Pro Glu Ser Arg Gly Thr Glu Leu Ser Asn Pro Tyr Lys Thr
275 280 285

Glu Lys Thr Asp Val Lys Asp Gln Leu Ile Ala Arg Ser Asp Asp Asn
290 295 300

Ile Asp Leu Ile Ser Thr Pro Ser Arg Arg
305 310

<210> 13

<211> 879

<212> DNA

<213> Streptococcus pneumoniae

<400> 13

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ccaattgaaa aaaatactca gtttagaggag gaagtccctc aagctgaagt cgaattggaa 180
agccagcaag aagagaaaaat tgaagctcct gaagacagtg aagcgagaac agaaatagaa 240
gaaaagaagg catctaattc tactgaagaa gagccagacc tttctaaaga aacagaaaaa 300
gtcactatag ctgaagagag ccaagaagct cttccctcagc aaaaagcaac cacgaaagag 360
ccacttccta tcagtaaattc tttagaaaagt ctttatatcc ccgaccaagc tccaaaatct 420
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ggacatatag caagcattaa cagtcgcttc cctgagcagc tagtccttt aactctttt 660
tctatcatct ctatcctagt agcgacaaca ctcttcttct tttcattcct cttggtagt 720

ttcggttgtga gacgatttat ccaccaggaa aaggactgga cgctagacaa gggttctccaa 780
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<210> 14
<211> 292
<212> PRT
<213> Streptococcus pneumoniae

<400> 14

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Lys Asn Lys Pro Glu Glu Gln Ala Gln Glu Val Ala Asp Lys Ala Glu
20 25 30

Glu Thr Ile Ala Asp Leu Asp Thr Pro Ile Glu Lys Asn Thr Gln Leu
35 40 45

Glu Glu Glu Val Pro Gln Ala Glu Val Glu Leu Glu Ser Gln Gln Glu
50 55 60

Glu Lys Ile Glu Ala Pro Glu Asp Ser Glu Ala Arg Thr Glu Ile Glu
65 70 75 80

Glu Lys Lys Ala Ser Asn Ser Thr Glu Glu Glu Pro Asp Leu Ser Lys
85 90 95

Glu Thr Glu Lys Val Thr Ile Ala Glu Glu Ser Gln Glu Ala Leu Pro
100 105 110

Gln Gln Lys Ala Thr Thr Lys Glu Pro Leu Leu Ile Ser Lys Ser Leu
115 120 125

Glu Ser Pro Tyr Ile Pro Asp Gln Ala Pro Lys Ser Arg Asp Lys Trp
130 135 140

Lys Glu Gln Val Leu Asp Phe Trp Ser Trp Leu Val Glu Ala Ile Lys
145 150 155 160

Ser Pro Thr Ser Lys Leu Glu Thr Ser Ile Thr His Ser Tyr Thr Ala
165 170 175

Phe Leu Leu Leu Ile Leu Phe Ser Ala Ser Ser Phe Phe Phe Ser Ile
180 185 190

Tyr His Ile Lys His Ala Tyr Tyr Gly His Ile Ala Ser Ile Asn Ser
195 200 205

Arg Phe Pro Glu Gln Leu Ala Pro Leu Thr Leu Phe Ser Ile Ile Ser
210 215 220

Ile Leu Val Ala Thr Thr Leu Phe Phe Ser Phe Leu Leu Gly Ser
225 230 235 240

Phe Val Val Arg Arg Phe Ile His Gln Glu Lys Asp Trp Thr Leu Asp
245 250 255

Lys Val Leu Gln Gln Tyr Ser Gln Leu Leu Ala Ile Pro Ile Ser Ser
260 265 270

Leu Leu Leu Val Ser Leu Leu Ser Leu Ile Ala Tyr Asp Leu Gln
275 280 285

Pro Ser Cys Val
290

<210> 15
<211> 990
<212> DNA
<213> Streptococcus pneumoniae

<400> 15

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 ctactttcca tgtccaaaga acctgtctat gatagccgta cggaaaagot aaccttggc 240
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<210> 16

<211> 329

<212> PRT

<213> Streptococcus pneumoniae

<400> 16

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5

10

15

Phe	Leu	Lys	Lys	Glu	Arg	Glu	Val	Ile	Ser	Met	Arg	Lys	Trp	Thr	Lys
20															

25

30

Gly	Phe	Leu	Ile	Phe	Gly	Val	Val	Thr	Thr	Val	Ile	Gly	Phe	Ile	Leu
35															

40

45

Leu	Phe	Val	Gly	Ile	Gln	Ser	Asp	Gly	Ile	Lys	Ser	Leu	Leu	Ser	Met
50															

55

60

Ser Lys Glu Pro Val Tyr Asp Ser Arg Thr Glu Lys Leu Thr Phe Gly
65 70 75 80

Lys Glu Val Glu Asn Leu Glu Ile Thr Leu His Gln His Thr Leu Thr
85 90 95

Ile Thr Asp Ser Phe Asp Asp Gln Ile His Ile Ser Tyr His Pro Ser
100 105 110

Leu Ser Ala His His Asp Leu Ile Thr Asn Gln Asn Asp Arg Thr Leu
115 120 125

Ser Leu Thr Asp Lys Lys Leu Ser Glu Thr Pro Phe Leu Ser Ser Gly
130 135 140

Ile Gly Gly Ile Leu His Ile Ala Ser Ser Tyr Ser Ser Arg Phe Glu
145 150 155 160

Glu Val Ile Leu Arg Leu Pro Lys Gly Arg Thr Leu Lys Gly Ile Asn
165 170 175

Ile Ser Ala Asn Arg Gly Gln Thr Thr Ile Ile Asn Ala Ser Leu Glu
180 185 190

Asn Ala Thr Leu Asn Thr Asn Ser Tyr Ile Leu Arg Ile Glu Gly Ser
195 200 205

Arg Ile Lys Asn Ser Lys Leu Thr Thr Pro Asn Ile Val Asn Ile Phe
210 215 220

Asp Thr Val Leu Thr Asp Ser Gln Leu Glu Ser Thr Glu Asn His Phe
225 230 235 240

His Ala Glu Asn Ile Gln Val His Gly Lys Val Glu Leu Thr Ala Lys
245 250 255

Asp Tyr Leu Arg Ile Ile Leu Asp Gln Lys Glu Ser Gln Arg Ile Asn
260 265 270

Trp Asp Ile Ser Ser Asn Tyr Gly Ser Ile Phe Gln Phe Thr Arg Glu
 275 280 285

Lys Pro Glu Ser Arg Gly Thr Glu Leu Ser Asn Pro Tyr Lys Thr Glu
 290 295 300

Lys Thr Asp Val Lys Asp Gln Leu Ile Ala Arg Ser Asp Asp Asn Ile
305 310 315 320

Asp Leu Ile Ser Thr Pro Ser Arg Arg
325

<210> 17
<211> 79
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 17
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ggacgcgtgct atttaatc 79

<210> 18
<211> 26
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 18
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Arg Val Gly Glu Gly Arg Cys Tyr Phe Asn
20 25

<210> 19
<211> 715
<212> DNA
<213> *Streptococcus pneumoniae*

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acccagcagt ggtcgatattt tggttagacgg tcaggagtt tcggaaaatc gcttggctat 180
taaacgaaag attggctacg tagcagactc gcctgactta ttttacgct taacggccaa 240
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ttgtggtaag gtagaggact tgagggaaaga ccacccagac cagttttgg aaagtatcta 660
ccttagtctt gctggtagaa aagaggaggt tgccgatgcg tctcaaggcattaa 715

<210> 20
<211> 237
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 20
Asp Lys Glu Ala Leu Ser Asn Leu Asn Leu Gln Ile Glu Asn Gly Glu
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Ile Met Gly Leu Ile Gly His Asn Gly Ala Gly Lys Ser Thr Thr Ile
20 25 30

Lys Ser Leu Val Ser Ile Ile Ser Pro Ser Ser Gly Arg Ile Leu Val
35 40 45

Asp Gly Gln Glu Leu Ser Glu Asn Arg Leu Ala Ile Lys Arg Lys Ile
50 55 60

Gly Tyr Val Ala Asp Ser Pro Asp Leu Phe Leu Arg Leu Thr Ala Asn
65 70 75 80

Glu Phe Trp Glu Leu Ile Ala Ser Ser Tyr Asp Leu Ser Arg Ser Asp
85 90 95

Leu Glu Ala Ser Leu Ala Arg Leu Leu Asn Val Phe Asp Phe Ala Glu
100 105 110

Asn Arg Tyr Gln Val Ile Glu Thr Leu Ser His Gly Met Arg Gln Lys
115 120 125

Val Phe Val Ile Gly Ala Leu Leu Ser Asp Pro Asp Ile Trp Val Leu
130 135 140

Asp Glu Pro Leu Thr Gly Leu Asp Pro Gln Ala Ala Phe Asp Leu Lys
145 150 155 160

Gln Met Met Lys Glu His Ala Gln Lys Gly Lys Thr Val Leu Phe Ser
165 170 175

Thr His Val Leu Glu Val Ala Glu Gln Val Cys Asp Arg Ile Ala Ile
180 185 190

Leu Lys Lys Gly His Leu Ile Tyr Cys Gly Lys Val Glu Asp Leu Arg
195 200 205

Lys Asp His Pro Asp Gln Ser Leu Glu Ser Ile Tyr Leu Ser Leu Ala
210 215 220

Gly Arg Lys Glu Glu Val Ala Asp Ala Ser Gln Gly His
225 230 235

<210> 21
<211> 360
<212> DNA
<213> Streptococcus pneumoniae

<400> 21
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tgttgcagg tttcagaaag aattttagca acttggctaa agaaaactact gctagtctct 180
tcagttgttg tagcttcggc aggttgttcc ttgatcatac gatccatcaa ggcaacttgg 240
tcatcttttg aaatggtttc aatgctggca ttgatttggc taatacgatt gtcattttta 300
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<210> 22
<211> 119
<212> PRT
<213> Streptococcus pneumoniae

<400> 22
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Ser Pro Ile Met Arg Pro Met Met Val Pro Thr Ile Glu Ile Lys Arg
20 25 30

Val Ile Pro Ala Pro Arg Lys Ser Cys Cys Gln Phe Ser Glu Arg Ile
35 40 45

Leu Ala Thr Trp Leu Lys Lys Leu Leu Leu Val Ser Ser Val Val Val
50 55 60

Ala Ser Ala Gly Cys Ser Leu Ile Ile Arg Ser Ile Lys Ala Thr Trp
65 70 75 80

Ser Ser Phe Glu Met Val Ser Met Leu Ala Leu Ile Trp Leu Ile Arg
85 90 95

Leu Ser Phe Leu Arg Ser Pro Ile Ala Ile Ala Val Ser Ser Ser Pro

100

105

110

Val Leu Lys Pro Gly Ser Thr

115

<210> 23

<211> 1455

<212> DNA

<213> Streptococcus pneumoniae

<400> 23

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cgcaaaaaca tttag

1455

<210> 24

<211> 484

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

Met Lys Phe Ser Lys Lys Tyr Ile Ala Ala Gly Ser Ala Val Ile Val			
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Ser Leu Ser Leu Cys Ala Tyr Ala Leu Asn Gln His Arg Ser Gln Glu			
20	25	30	

Asn Lys Asp Asn Asn Arg Val Ser Tyr Val Asp Gly Ser Gln Ser Ser			
35	40	45	

Gln Lys Ser Glu Asn Leu Thr Pro Asp Gln Val Ser Gln Lys Glu Gly			
50	55	60	

Ile Gln Ala Glu Gln Ile Val Ile Lys Ile Thr Asp Gln Gly Tyr Val			
65	70	75	80

Thr Ser His Gly Asp His Tyr His Tyr Asn Gly Lys Val Pro Tyr			
85	90	95	

Asp Ala Leu Phe Ser Glu Glu Leu Leu Met Lys Asp Pro Asn Tyr Gln			
100	105	110	

Leu Lys Asp Ala Asp Ile Val Asn Glu Val Lys Gly Gly Tyr Ile Ile			
115	120	125	

Lys Val Asp Gly Lys Tyr Tyr Val Tyr Leu Lys Asp Ala Ala His Ala			
130	135	140	

Asp Asn Val Arg Thr Lys Asp Glu Ile Asn Arg Gln Lys Gln Glu His			
145	150	155	160

Val Lys Asp Asn Glu Lys Val Asn Ser Asn Val Ala Val Ala Arg Ser
165 170 175

Gln Gly Arg Tyr Thr Thr Asn Asp Gly Tyr Val Phe Asn Pro Ala Asp
180 185 190

Ile Ile Glu Asp Thr Gly Asn Ala Tyr Ile Val Pro His Gly Gly His
195 200 205

Tyr His Tyr Ile Pro Lys Ser Asp Leu Ser Ala Ser Glu Leu Ala Ala
210 215 220

Ala Lys Ala His Leu Ala Gly Lys Asn Met Gln Pro Ser Gln Leu Ser
225 230 235 240

Tyr Ser Ser Thr Ala Ser Asp Asn Asn Thr Gln Ser Val Ala Lys Gly
245 250 255

Ser Thr Ser Lys Pro Ala Asn Lys Ser Glu Asn Leu Gln Ser Leu Leu
260 265 270

Lys Glu Leu Tyr Asp Ser Pro Ser Ala Gln Arg Tyr Ser Glu Ser Asp
275 280 285

Gly Leu Val Phe Asp Pro Ala Lys Ile Ile Ser Arg Thr Pro Asn Gly
290 295 300

Val Ala Ile Pro His Gly Asp His Tyr His Phe Ile Pro Tyr Ser Lys
305 310 315 320

Leu Ser Ala Leu Glu Glu Lys Ile Ala Arg Met Val Pro Ile Ser Gly
325 330 335

Thr Gly Ser Thr Val Ser Thr Asn Ala Lys Pro Asn Glu Val Val Ser
340 345 350

Ser Leu Gly Ser Leu Ser Ser Asn Pro Ser Ser Leu Thr Thr Ser Lys
355 360 365

Glu Leu Ser Ser Ala Ser Asp Gly Tyr Ile Phe Asn Pro Lys Asp Ile
 370 375 380

Val Glu Glu Thr Ala Thr Ala Tyr Ile Val Arg His Gly Asp His Phe
 385 390 395 400

His Tyr Ile Pro Lys Ser Asn Gln Ile Gly Gln Pro Thr Leu Pro Asn
 405 410 415

Asn Ser Leu Ala Thr Pro Ser Pro Ser Leu Pro Ile Asn Pro Gly Thr
 420 425 430

Ser His Glu Lys His Glu Glu Asp Gly Tyr Gly Phe Asp Ala Asn Arg
 435 440 445

Ile Ile Ala Glu Asp Glu Ser Gly Phe Val Met Ser His Gly Asp His
 450 455 460

Asn His Tyr Phe Phe Lys Lys Asp Leu Thr Glu Glu Gln Ile Lys Val
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Arg Lys Asn Ile

<210> 25

<211> 840

<212> DNA

<213> Streptococcus pneumoniae

<400> 25

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Asn Phe Gly Val Ser Glu Glu Asp Ala Val Lys Thr Ala Arg Glu Lys
115 120 125

Leu Ala Leu Val Gly Ile Asp Glu Ser Leu Phe Asp Arg Ser Pro Phe
130 135 140

Glu Leu Ser Gly Gly Gln Met Arg Arg Val Ala Ile Ala Gly Ile Leu
145 150 155 160

Ala Met Glu Pro Ala Ile Leu Val Leu Asp Glu Pro Thr Ala Gly Leu
165 170 175

Asp Pro Leu Gly Arg Lys Glu Leu Met Thr Leu Phe Lys Lys Leu His
180 185 190

Gln Ser Gly Met Thr Ile Val Leu Val Thr His Leu Met Asp Asp Val
195 200 205

Ala Glu Tyr Ala Asn Gln Val Tyr Val Met Glu Lys Gly Arg Leu Val
210 215 220

Lys Gly Gly Lys Pro Ser Asp Val Phe Gln Asp Val Val Phe Met Glu
225 230 235 240

Glu Val Gln Leu Gly Val Pro Lys Ile Thr Ala Phe Cys Lys Arg Leu
245 250 255

Ala Asp Arg Gly Val Ser Phe Lys Arg Leu Pro Ile Lys Ile Glu Glu
260 265 270

Phe Lys Glu Ser Leu Asn Gly
275

<210> 27

<211> 6360

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 27

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<211> 2119

<212> PRT

<213> Streptococcus pneumoniae

<400> 28

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Ile His Ser Ala Met Glu Thr Ser Gln Asp Phe Lys Glu Lys Lys Thr
35 40 45

Ala Val Ile Lys Glu Lys Glu Val Val Ser Lys Asn Pro Val Ile Asp
50 55 60

Asn Asn Thr Ser Asn Glu Glu Ala Lys Ile Lys Glu Glu Asn Ser Asn
65 70 75 80

Lys Ser Gln Gly Asp Tyr Thr Asp Ser Phe Val Asn Lys Asn Thr Glu
85 90 95

Asn Pro Lys Lys Glu Asp Lys Val Val Tyr Ile Ala Glu Phe Lys Asp
100 105 110

Lys Glu Ser Gly Glu Lys Ala Ile Lys Glu Leu Ser Ser Leu Lys Asn
115 120 125

Thr Lys Val Leu Tyr Thr Tyr Asp Arg Ile Phe Asn Gly Ser Ala Ile
130 135 140

Glu Thr Thr Pro Asp Asn Leu Asp Lys Ile Lys Gln Ile Glu Gly Ile
145 150 155 160

Ser Ser Val Glu Arg Ala Gln Lys Val Gln Pro Met Met Asn His Ala
165 170 175

Arg Lys Glu Ile Gly Val Glu Glu Ala Ile Asp Tyr Leu Lys Ser Ile
180 185 190

Asn Ala Pro Phe Gly Lys Asn Phe Asp Gly Arg Gly Met Val Ile Ser
195 200 205

Asn Ile Asp Thr Gly Thr Asp Tyr Arg His Lys Ala Met Arg Ile Asp
210 215 220

Asp Asp Ala Lys Ala Ser Met Arg Phe Lys Lys Glu Asp Leu Lys Gly
225 230 235 240

Thr Asp Lys Asn Tyr Trp Leu Ser Asp Lys Ile Pro His Ala Phe Asn
245 250 255

Tyr Tyr Asn Gly Gly Lys Ile Thr Val Glu Lys Tyr Asp Asp Gly Arg
260 265 270

Asp Tyr Phe Asp Pro His Gly Met His Ile Ala Gly Ile Leu Ala Gly
275 280 285

Asn Asp Thr Glu Gln Asp Ile Lys Asn Phe Asn Gly Ile Asp Gly Ile
290 295 300

Ala Pro Asn Ala Gln Ile Phe Ser Tyr Lys Met Tyr Ser Asp Ala Gly
305 310 315 320

Ser Gly Phe Ala Gly Asp Glu Thr Met Phe His Ala Ile Glu Asp Ser
325 330 335

Ile Lys His Asn Val Asp Val Val Ser Val Ser Ser Gly Phe Thr Gly
340 345 350

Thr Gly Leu Val Gly Glu Lys Tyr Trp Gln Ala Ile Arg Ala Leu Arg
355 360 365

Lys Ala Gly Ile Pro Met Val Val Ala Thr Gly Asn Tyr Ala Thr Ser
370 375 380

Ala Ser Ser Ser Trp Asp Leu Val Ala Asn Asn His Leu Lys Met
385 390 395 400

Thr Asp Thr Gly Asn Val Thr Arg Thr Ala Ala His Glu Asp Ala Ile
405 410 415

Ala Val Ala Ser Ala Lys Asn Gln Thr Val Glu Phe Asp Lys Val Asn
420 425 430

Ile Gly Gly Glu Ser Phe Lys Tyr Arg Asn Ile Gly Ala Phe Phe Asp
435 440 445

Lys Ser Lys Ile Thr Thr Asn Glu Asp Gly Thr Lys Ala Pro Ser Lys
450 455 460

Leu Lys Phe Val Tyr Ile Gly Lys Gly Gln Asp Gln Asp Leu Ile Gly
465 470 475 480

Leu Asp Leu Arg Gly Lys Ile Ala Val Met Asp Arg Ile Tyr Thr Lys
485 490 495

Asp Leu Lys Asn Ala Phe Lys Lys Ala Met Asp Lys Gly Ala Arg Ala
500 505 510

Ile Met Val Val Asn Thr Val Asn Tyr Tyr Asn Arg Asp Asn Trp Thr
515 520 525

Glu Leu Pro Ala Met Gly Tyr Glu Ala Asp Glu Gly Thr Lys Ser Gln
530 535 540

Val Phe Ser Ile Ser Gly Asp Asp Gly Val Lys Leu Trp Asn Met Ile
545 550 555 560

Asn Pro Asp Lys Lys Thr Glu Val Lys Arg Asn Asn Lys Glu Asp Phe
565 570 575

Lys Asp Lys Leu Glu Gln Tyr Tyr Pro Ile Asp Met Glu Ser Phe Asn
580 585 590

Ser Asn Lys Pro Asn Val Gly Asp Glu Lys Glu Ile Asp Phe Lys Phe
595 600 605

Ala Pro Asp Thr Asp Lys Glu Leu Tyr Lys Glu Asp Ile Ile Val Pro
610 615 620

Ala Gly Ser Thr Ser Trp Gly Pro Arg Ile Asp Leu Leu Leu Lys Pro
625 630 635 640

Asp Val Ser Ala Pro Gly Lys Asn Ile Lys Ser Thr Leu Asn Val Ile
645 650 655

Asn Gly Lys Ser Thr Tyr Gly Tyr Met Ser Gly Thr Ser Met Ala Thr
660 665 670

Pro Ile Val Ala Ala Ser Thr Val Leu Ile Arg Pro Lys Leu Lys Glu
675 680 685

Met Leu Glu Arg Pro Val Leu Lys Asn Leu Lys Gly Asp Asp Lys Ile
690 695 700

Asp Leu Thr Ser Leu Thr Lys Ile Ala Leu Gln Asn Thr Ala Arg Pro
705 710 715 720

Met Met Asp Ala Thr Ser Trp Lys Glu Lys Ser Gln Tyr Phe Ala Ser
725 730 735

Pro Arg Gln Gln Gly Ala Gly Leu Ile Asn Val Ala Asn Ala Leu Arg
740 745 750

Asn Glu Val Val Ala Thr Phe Lys Asn Thr Asp Ser Lys Gly Leu Val
755 760 765

Asn Ser Tyr Gly Ser Ile Ser Leu Lys Glu Ile Lys Gly Asp Lys Lys
770 775 780

Tyr Phe Thr Ile Lys Leu His Asn Thr Ser Asn Arg Pro Leu Thr Phe
785 790 795 800

Lys Val Ser Ala Ser Ala Ile Thr Thr Asp Ser Leu Thr Asp Arg Leu
805 810 815

Lys Leu Asp Glu Thr Tyr Lys Asp Glu Lys Ser Pro Asp Gly Lys Gln
820 825 830

Ile Val Pro Glu Ile His Pro Glu Lys Val Lys Gly Ala Asn Ile Thr
835 840 845

Phe Glu His Asp Thr Phe Thr Ile Gly Ala Asn Ser Ser Phe Asp Leu
850 855 860

Asn Ala Val Ile Asn Val Gly Glu Ala Lys Asn Lys Asn Lys Phe Val
865 870 875 880

Glu Ser Phe Ile His Phe Glu Ser Val Glu Ala Met Glu Ala Leu Asn
885 890 895

Ser Ser Gly Lys Ile Asn Phe Gln Pro Ser Leu Ser Met Pro Leu
900 905 910

Met Gly Phe Ala Gly Asn Trp Asn His Glu Pro Ile Leu Asp Lys Trp
915 920 925

Ala Trp Glu Glu Gly Ser Arg Ser Lys Thr Leu Gly Gly Tyr Asp Asp
930 935 940

Asp Gly Lys Pro Lys Ile Pro Gly Thr Leu Asn Lys Gly Ile Gly Gly
945 950 955 960

Glu His Gly Ile Asp Lys Phe Asn Pro Ala Gly Val Ile Gln Asn Arg
965 970 975

Lys Asp Lys Asn Thr Thr Ser Leu Asp Gln Asn Pro Glu Leu Phe Ala
980 985 990

Phe Asn Asn Glu Gly Ile Asn Ala Pro Ser Ser Ser Gly Ser Lys Ile
995 1000 1005

Ala Asn Ile Tyr Pro Leu Asp Ser Asn Gly Asn Pro Gln Asp Ala Gln
1010 1015 1020

Leu Glu Arg Gly Leu Thr Pro Ser Pro Leu Val Leu Arg Ser Ala Glu
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Glu Gly Leu Ile Ser Ile Val Asn Thr Asn Lys Glu Gly Glu Asn Gln
1045 1050 1055

Arg Asp Leu Lys Val Ile Ser Arg Glu His Phe Ile Arg Gly Ile Leu
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Asn Ser Lys Ser Asn Asp Ala Lys Gly Ile Lys Ser Ser Lys Leu Lys
1075 1080 1085

Val Trp Gly Asp Leu Lys Trp Asp Gly Leu Ile Tyr Asn Pro Arg Gly
1090 1095 1100

Arg Glu Glu Asn Ala Pro Glu Ser Lys Asp Asn Gln Asp Pro Ala Thr
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Lys Ile Arg Gly Gln Phe Glu Pro Ile Ala Glu Gly Gln Tyr Phe Tyr
1125 1130 1135

Lys Phe Lys Tyr Arg Leu Thr Lys Asp Tyr Pro Trp Gln Val Ser Tyr
1140 1145 1150

Ile Pro Val Lys Ile Asp Asn Thr Ala Pro Lys Ile Val Ser Val Asp
1155 1160 1165

Phe Ser Asn Pro Glu Lys Ile Lys Leu Ile Thr Lys Asp Thr Tyr His
1170 1175 1180

Lys Val Lys Asp Gln Tyr Lys Asn Glu Thr Leu Phe Ala Arg Asp Gln
1185 1190 1195 1200

Lys Glu His Pro Glu Lys Phe Asp Glu Ile Ala Asn Glu Val Trp Tyr
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Ala Gly Ala Ala Leu Val Asn Glu Asp Gly Glu Val Glu Lys Asn Leu
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Glu Val Thr Tyr Ala Gly Glu Gly Gln Gly Arg Asn Arg Lys Leu Asp
1235 1240 1245

Lys Asp Gly Asn Thr Ile Tyr Glu Ile Lys Gly Ala Gly Asp Leu Arg
1250 1255 1260

Gly Lys Ile Ile Glu Val Ile Ala Leu Asp Gly Ser Ser Asn Phe Thr
1265 1270 1275 1280

Lys Ile His Arg Ile Lys Phe Ala Asn Gln Ala Asp Glu Lys Gly Met
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Ile Ser Tyr Tyr Leu Val Asp Pro Asp Gln Asp Ser Ser Lys Tyr Gln
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Lys Leu Gly Glu Ile Ala Glu Ser Lys Phe Lys Asn Leu Gly Asn Gly
1315 1320 1325

Lys Glu Gly Ser Leu Lys Lys Asp Thr Thr Gly Val Glu His His His
1330 1335 1340

Gln Glu Asn Glu Glu Ser Ile Lys Glu Lys Ser Ser Phe Thr Ile Asp
1345 1350 1355 1360

Arg Asn Ile Ser Thr Ile Arg Asp Phe Glu Asn Lys Asp Leu Lys Lys
1365 1370 1375

Leu Ile Lys Lys Phe Arg Glu Val Asp Asp Phe Thr Ser Glu Thr
1380 1385 1390

Gly Lys Arg Met Glu Glu Tyr Asp Tyr Lys Tyr Asp Asp Lys Gly Asn
1395 1400 1405

Ile Ile Ala Tyr Asp Asp Gly Thr Asp Leu Glu Tyr Glu Thr Glu Lys
1410 1415 1420

Leu Asp Glu Ile Lys Ser Lys Ile Tyr Gly Val Leu Ser Pro Ser Lys
1425 1430 1435 1440

Asp Gly His Phe Glu Ile Leu Gly Lys Ile Ser Asn Val Ser Lys Asn
1445 1450 1455

Ala Lys Val Tyr Tyr Gly Asn Asn Tyr Lys Ser Ile Glu Ile Lys Ala
1460 1465 1470

Thr Lys Tyr Asp Phe His Ser Lys Thr Met Thr Phe Asp Leu Tyr Ala
1475 1480 1485

Asn Ile Asn Asp Ile Val Asp Gly Leu Ala Phe Ala Gly Asp Met Arg
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Leu Phe Val Lys Asp Asn Asp Gln Lys Lys Ala Glu Ile Lys Ile Arg
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Met Pro Glu Lys Ile Lys Glu Thr Lys Ser Glu Tyr Pro Tyr Val Ser
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Ser Tyr Gly Asn Val Ile Glu Leu Gly Glu Gly Asp Leu Ser Lys Asn
1540 1545 1550

Lys Pro Asp Asn Leu Thr Lys Met Glu Ser Gly Lys Ile Tyr Ser Asp
1555 1560 1565

Ser Glu Lys Gln Gln Tyr Leu Leu Lys Asp Asn Ile Ile Leu Arg Lys
1570 1575 1580

Gly Tyr Ala Leu Lys Val Thr Thr Tyr Asn Pro Gly Lys Thr Asp Met
1585 1590 1595 1600

Leu Glu Gly Asn Gly Val Tyr Ser Lys Glu Asp Ile Ala Lys Ile Gln
1605 1610 1615

Lys Ala Asn Pro Asn Leu Arg Ala Leu Ser Glu Thr Thr Ile Tyr Ala
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Asp Ser Arg Asn Val Glu Asp Gly Arg Ser Thr Gln Ser Val Leu Met
1635 1640 1645

Ser Ala Leu Asp Gly Phe Asn Ile Ile Arg Tyr Gln Val Phe Thr Phe
1650 1655 1660

Lys Met Asn Asp Lys Gly Glu Ala Ile Asp Lys Asp Gly Asn Leu Val
1665 1670 1675 1680

Thr Asp Ser Ser Lys Leu Val Leu Phe Gly Lys Asp Asp Lys Glu Tyr
1685 1690 1695

Thr Gly Glu Asp Lys Phe Asn Val Glu Ala Ile Lys Glu Asp Gly Ser
1700 1705 1710

Met Leu Phe Ile Asp Thr Lys Pro Val Asn Leu Ser Met Asp Lys Asn
1715 1720 1725

Tyr Phe Asn Pro Ser Lys Ser Asn Lys Ile Tyr Val Arg Asn Pro Glu
1730 1735 1740

Phe Tyr Leu Arg Gly Lys Ile Ser Asp Lys Gly Phe Asn Trp Glu
1745 1750 1755 1760

Leu Arg Val Asn Glu Ser Val Val Asp Asn Tyr Leu Ile Tyr Gly Asp
1765 1770 1775

Leu His Ile Asp Asn Thr Arg Asp Phe Asn Ile Lys Leu Asn Val Lys
1780 1785 1790

Asp Gly Asp Ile Met Asp Trp Gly Met Lys Asp Tyr Lys Ala Asn Gly
1795 1800 1805

Phe Pro Asp Lys Val Thr Asp Met Asp Gly Asn Val Tyr Leu Gln Thr
1810 1815 1820

Gly Tyr Ser Asp Leu Asn Ala Lys Ala Val Gly Val His Tyr Gln Phe
1825 1830 1835 1840

Leu Tyr Asp Asn Val Lys Pro Glu Val Asn Ile Asp Pro Lys Gly Asn
 1845 1850 1855

Thr Ser Ile Glu Tyr Ala Asp Gly Lys Ser Val Val Phe Asn Ile Asn
 1860 1865 1870

Asp Lys Arg Asn Asn Gly Phe Asp Gly Glu Ile Gln Glu Gln His Ile
 1875 1880 1885

Tyr Ile Asn Gly Lys Glu Tyr Thr Ser Phe Asn Asp Ile Lys Gln Ile
 1890 1895 1900

Ile Asp Lys Thr Leu Asn Ile Lys Ile Val Val Lys Asp Phe Ala Arg
 1905 1910 1915 1920

Asn Thr Thr Val Lys Glu Phe Ile Leu Asn Lys Asp Thr Gly Glu Val
 1925 1930 1935

Ser Glu Leu Lys Pro His Arg Val Thr Val Thr Ile Gln Asn Gly Lys
 1940 1945 1950

Glu Met Ser Ser Thr Ile Val Ser Glu Glu Asp Phe Ile Leu Pro Val
 1955 1960 1965

Tyr Lys Gly Glu Leu Glu Lys Gly Tyr Gln Phe Asp Gly Trp Glu Ile
 1970 1975 1980

Ser Gly Phe Glu Gly Lys Lys Asp Ala Gly Tyr Val Ile Asn Leu Ser
 1985 1990 1995 2000

Lys Asp Thr Phe Ile Lys Pro Val Phe Lys Lys Ile Glu Glu Lys Lys
 2005 2010 2015

Glu Glu Glu Asn Lys Pro Thr Phe Asp Val Ser Lys Lys Asp Asn
 2020 2025 2030

Pro Gln Val Asn His Ser Gln Leu Asn Glu Ser His Arg Lys Glu Asp
 2035 2040 2045

Leu Gln Arg Glu Glu His Ser Gln Lys Ser Asp Ser Thr Lys Asp Val
2050 2055 2060

Thr Ala Thr Val Leu Asp Lys Asn Asn Ile Ser Ser Lys Ser Thr Thr
2065 2070 2075 2080

Asn Asn Pro Asn Lys Leu Pro Lys Thr Gly Thr Ala Ser Gly Ala Gln
2085 2090 2095

Thr Leu Leu Ala Ala Gly Ile Met Phe Ile Val Gly Ile Phe Leu Gly
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Leu Lys Lys Lys Asn Gln Asp

2115

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<211> 597

<212> DNA

<213> Streptococcus pneumoniae

<400> 29

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<211> 198
<212> PRT
<213> Streptococcus pneumoniae

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Ala Pro Ser Ala His Asn Ser Gln Pro Trp Lys Phe Val Val Val Arg
35 40 45

Glu Lys Asn Ala Glu Leu Ala Lys Leu Ala Tyr Gly Ser Asn Phe Glu
50 55 60

Gln Val Ser Ser Ala Pro Val Thr Ile Ala Leu Phe Thr Asp Thr Asp
65 70 75 80

Leu Ala Lys Arg Ala Arg Lys Ile Ala Arg Val Gly Gly Ala Asn Asn
85 90 95

Phe Ser Glu Glu Gln Leu Gln Tyr Phe Met Lys Asn Leu Pro Ala Glu
100 105 110

Phe Ala Arg Tyr Ser Glu Gln Gln Val Ser Asp Tyr Leu Ala Leu Asn
115 120 125

Ala Gly Leu Val Ala Met Asn Leu Val Leu Ala Leu Thr Asp Gln Gly
130 135 140

Ile Gly Ser Asn Ile Ile Leu Gly Phe Asp Lys Ser Lys Val Asn Glu
145 150 155 160

Val Leu Glu Ile Glu Asp Arg Phe Arg Pro Glu Leu Leu Ile Thr Val
165 170 175

Gly Tyr Thr Asp Glu Lys Leu Glu Pro Ser Tyr Arg Leu Pro Val Asp
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Glu Ile Ile Glu Lys Arg
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<211> 466

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<400> 32

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35 40 45

Ala Leu Glu Lys Phe Leu Glu Ile Ala Asp Arg Asp Gly Tyr Pro Thr

50 55 60

Lys Asn Val Asp Asn Tyr Ala Gly His Phe Glu Phe Gly Asp Gly Glu

65 70 75 80

Glu Val Leu Gly Ile Phe Ala His Met Asp Val Val Pro Ala Gly Ser

85 90 95

Gly Trp Asp Thr Asp Pro Tyr Thr Pro Thr Ile Lys Asp Gly Arg Leu

100 105 110

Tyr Ala Arg Gly Ala Ser Asp Asp Lys Gly Pro Thr Thr Ala Cys Tyr

115 120 125

Tyr Gly Leu Lys Ile Ile Lys Glu Leu Gly Leu Pro Thr Ser Lys Lys

130 135 140

Val Arg Phe Ile Val Gly Thr Asp Glu Glu Ser Gly Trp Ala Asp Met

145 150 155 160

Asp Tyr Tyr Phe Glu His Val Gly Leu Ala Lys Pro Asp Phe Gly Phe
165 170 175

Ser Pro Asp Ala Glu Phe Pro Ile Ile Asn Gly Glu Lys Gly Asn Ile
180 185 190

Thr Glu Tyr Leu His Phe Ala Gly Glu Asn Thr Gly Val Ala Arg Leu
195 200 205

His Ser Phe Thr Gly Gly Leu Arg Glu Asn Met Val Pro Glu Ser Ala
210 215 220

Thr Ala Val Val Ser Gly Asp Leu Ala Asp Leu Gln Ala Lys Leu Asp
225 230 235 240

Ala Phe Val Ala Glu His Lys Leu Arg Gly Glu Leu Gln Glu Glu Ala
245 250 255

Gly Lys Tyr Lys Val Thr Ile Ile Gly Lys Ser Ala His Gly Ala Met
260 265 270

Pro Ala Ser Gly Val Asn Gly Ala Thr Tyr Leu Ala Leu Phe Leu Ser
275 280 285

Gln Phe Gly Phe Ala Gly Pro Ala Lys Asp Tyr Leu Asp Ile Ala Gly
290 295 300

Lys Ile Leu Leu Asn Asp His Glu Gly Glu Asn Leu Lys Ile Ala His
305 310 315 320

Val Asp Glu Lys Met Gly Ala Leu Ser Met Asn Ala Gly Val Phe His
325 330 335

Phe Asp Glu Thr Ser Ala Asp Asn Thr Ile Ala Leu Asn Ile Arg Tyr
340 345 350

Pro Lys Gly Thr Ser Pro Glu Gln Ile Lys Ser Ile Leu Glu Asn Leu
355 360 365

Pro Val Val Ser Val Ser Leu Ser Glu His Gly His Thr Pro His Tyr
 370 375 380

Val Pro Met Glu Asp Pro Leu Val Gln Thr Leu Leu Asn Ile Tyr Glu
 385 390 395 400

Lys Gln Thr Gly Phe Lys Gly His Glu Gln Val Ile Gly Gly Thr
 405 410 415

Phe Gly Arg Leu Leu Glu Arg Gly Val Ala Tyr Gly Ala Met Phe Pro
 420 425 430

Asp Ser Ile Asp Thr Met His Gln Ala Asn Glu Phe Ile Ala Leu Asp
 435 440 445

Asp Leu Phe Arg Ala Ala Ile Tyr Ala Glu Ala Ile Tyr Glu Leu
 450 455 460

Ile Lys
 465

<210> 33
<211> 1617
<212> DNA
<213> Streptococcus pneumoniae

<400> 33
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attgcgatga atttagagcg gttttgaaa ttgtcaatct accaaatgat tgtctgggt 180
gggataatat tccttgactg gtagtgaaa aattatcagg ttgaagtgtat ccaagagttt 240
aatctagaga ttcgaaatag agttgccaca gacatctcta actctaccta tcaagaattt 300
catagtaaat catcaggaac atatcttcg tggctaaata atgatgttca gactttaat 360
gatcaggcgt ttaaacaaact ttttttagta ataaaaaggaa tttctggtag tataattgca 420
gttgtgactc ttaatcacta tcattggtca ttgactgttag ccacctgtt ttcattaaatg 480
attatgctac ttgtacccaaa aatcttgca tcgaaaatgc gagaagttag tctaaattta 540

actaaccaaa atgaagcttt tttaaaatct agtgagacta tattgaatgg atttgatgtg 600
 ttagcgtcct tgaatctttt atatgtattt cctaagaaaa ttaaagaagc aggaatttta 660
 tttaaagatgg ttatacaaag aaagacaact gtagaaacgt tagcaggcgc tattagcttc 720
 tttctcaata tttttttca gatatctctc gttttttaa caggctatct tgcaataaaa 780
 ggaatagtga aaattggta tattgaagca ataggagcac taacaggtgt tattttaca 840
 gcgcctaggtg aattaggagg tcaatttatcc tctattattt gtagaagcc tattttttta 900
 aaattgtatt caattaatcc aattgagtca aataaaatga atgatatcga accaaatgag 960
 gtgaatagag atttccgtt atatgaagca aaaaatattt gctataagta tggagataaa 1020
 gaaatattaa aaaacttaaa tttttgtttt caacgtaatg aaaagtattt aatttttagt 1080
 gaaagtggaa gcgggaaatc tacattatta aaattattga atggctttt gagagattat 1140
 agtggagaat tgcgattctg cggggatgtat aaaaaaaaaa cctcctattt aaatatggtt 1200
 tcgaatgttc tatatgtaga tcaaaaagct tatttgtttt aaggtacgt tagagataat 1260
 attttattgg aagaaaattt tactgtatgaa gaaatactac agtctttaga gcaagttgg 1320
 ttgagtgtaa aagattttcc taataacatt ttagattatt atgttggta tgatggaga 1380
 ttactgtcag gagggcagaa aaaaaaaaaa actttagcta gagggctaata tagaaataag 1440
 aaaatagtat taattgacga gggacttct gctatcgata ggagaacttc gttagcgatt 1500
 gaacgtaa tattagatag agaggattt actgtcatta ttgttaccca tgctccgcat 1560
 ccggaaactta aacaatattt tactaagata tatcaatttc caaaggattt tatttaa 1617

<210> 34

<211> 538

<212> PRT

<213> Streptococcus pneumoniae

<400> 34

Met Tyr Thr Ile Ile Lys Ser Asn Ile Lys Lys Phe Ser Leu Leu Thr

1

5

10

15

Ile Phe Ile Val Ala Gly Gln Leu Leu Leu Ile Tyr Ala Ala Thr Ile

20

25

30

Asn Ala Leu Val Leu Asn Glu Leu Ile Ala Met Asn Leu Glu Arg Phe

35

40

45

Leu Lys Leu Ser Ile Tyr Gln Met Ile Val Trp Cys Gly Ile Ile Phe

50

55

60

Leu Asp Trp Val Val Lys Asn Tyr Gln Val Glu Val Ile Gln Glu Phe
65 70 75 80

Asn Leu Glu Ile Arg Asn Arg Val Ala Thr Asp Ile Ser Asn Ser Thr
85 90 95

Tyr Gln Glu Phe His Ser Lys Ser Ser Gly Thr Tyr Leu Ser Trp Leu
100 105 110

Asn Asn Asp Val Gln Thr Leu Asn Asp Gln Ala Phe Lys Gln Leu Phe
115 120 125

Leu Val Ile Lys Gly Ile Ser Gly Thr Ile Phe Ala Val Val Thr Leu
130 135 140

Asn His Tyr His Trp Ser Leu Thr Val Ala Thr Leu Phe Ser Leu Met
145 150 155 160

Ile Met Leu Leu Val Pro Lys Ile Phe Ala Ser Lys Met Arg Glu Val
165 170 175

Ser Leu Asn Leu Thr Asn Gln Asn Glu Ala Phe Leu Lys Ser Ser Glu
180 185 190

Thr Ile Leu Asn Gly Phe Asp Val Leu Ala Ser Leu Asn Leu Tyr
195 200 205

Val Leu Pro Lys Lys Ile Lys Glu Ala Gly Ile Leu Leu Lys Met Val
210 215 220

Ile Gln Arg Lys Thr Thr Val Glu Thr Leu Ala Gly Ala Ile Ser Phe
225 230 235 240

Phe Leu Asn Ile Phe Phe Gln Ile Ser Leu Val Phe Leu Thr Gly Tyr
245 250 255

Leu Ala Ile Lys Gly Ile Val Lys Ile Gly Thr Ile Glu Ala Ile Gly
260 265 270

Ala Leu Thr Gly Val Ile Phe Thr Ala Leu Gly Glu Leu Gly Gly Gln
275 280 285

Leu Ser Ser Ile Ile Gly Thr Lys Pro Ile Phe Leu Lys Leu Tyr Ser
290 295 300

Ile Asn Pro Ile Glu Ser Asn Lys Met Asn Asp Ile Glu Pro Asn Glu
305 310 315 320

Val Asn Arg Asp Phe Pro Leu Tyr Glu Ala Lys Asn Ile Cys Tyr Lys
325 330 335

Tyr Gly Asp Lys Glu Ile Leu Lys Asn Leu Asn Phe Cys Phe Gln Arg
340 345 350

Asn Glu Lys Tyr Leu Ile Leu Gly Glu Ser Gly Ser Gly Lys Ser Thr
355 360 365

Leu Leu Lys Leu Leu Asn Gly Phe Leu Arg Asp Tyr Ser Gly Glu Leu
370 375 380

Arg Phe Cys Gly Asp Asp Ile Lys Lys Thr Ser Tyr Leu Asn Met Val
385 390 395 400

Ser Asn Val Leu Tyr Val Asp Gln Lys Ala Tyr Leu Phe Glu Gly Thr
405 410 415

Ile Arg Asp Asn Ile Leu Leu Glu Asn Tyr Thr Asp Glu Glu Ile
420 425 430

Leu Gln Ser Leu Glu Gln Val Gly Leu Ser Val Lys Asp Phe Pro Asn
435 440 445

Asn Ile Leu Asp Tyr Tyr Val Gly Asp Asp Gly Arg Leu Leu Ser Gly
450 455 460

Gly Gln Lys Gln Lys Ile Thr Leu Ala Arg Gly Leu Ile Arg Asn Lys
465 470 475 480

Lys Ile Val Leu Ile Asp Glu Gly Thr Ser Ala Ile Asp Arg Arg Thr
485 490 495

Ser Leu Ala Ile Glu Arg Lys Ile Leu Asp Arg Glu Asp Leu Thr Val
500 505 510

Ile Ile Val Thr His Ala Pro His Pro Glu Leu Lys Gln Tyr Phe Thr
515 520 525

Lys Ile Tyr Gln Phe Pro Lys Asp Phe Ile
530 535

<210> 35

<211> 705

<212> DNA

<213> Streptococcus pneumoniae

<400> 35

ataaacagtta aacagattat ggacgaaata gccgtttcag atatgactgc aaggcgctat 60
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cgaaccaact cccttttgc taatgagcga tcaaatatgg aaaaacaagc cctccaaacg 180
gcagaaaaac aagaaatagc ccattttgca ggcagtctag tagaagaaaag agaaaactatt 240
ttcattggac caggaacaac attagagttt ttgcgcgtg agttgcctat tgacaatatac 300
cgcgtcgtaa ccaacagtct acctgtttt ctgattttaa gccaacgaaa attaacagat 360
ttgattttaa taggtggaaa ttatcgcat attacaggtg cttttgttgg tacattgacc 420
ctacaaaatc tctctaattct ccaattttct aaagcttcg ttagctgtaa tggtattcaa 480
aacggagctc tagctacttt tagcgaggaa gagggagagg ctcaacgcatt cgctttaat 540
aattctaata aaaaatattt actcgcat catagcaagt tcaataagtt tgattttat 600
actttttata atgtatcaaa tcttgataact attgtttcag attctaaact aagtgattca 660
atcctttta agctatctaa acacattaaa gtcatcaagc cttaa 705

<210> 36

<211> 234

<212> PRT

<213> Streptococcus pneumoniae

<400> 36

Ile Thr Val Lys Gln Ile Met Asp Glu Ile Ala Val Ser Asp Met Thr
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Ala Arg Arg Tyr Leu Gln Glu Leu Ala Asp Lys Asp Leu Leu Ile Arg
20 25 30

Val His Gly Gly Ala Glu Lys Leu Arg Thr Asn Ser Leu Leu Thr Asn
35 40 45

Glu Arg Ser Asn Ile Glu Lys Gln Ala Leu Gln Thr Ala Glu Lys Gln
50 55 60

Glu Ile Ala His Phe Ala Gly Ser Leu Val Glu Glu Arg Glu Thr Ile
65 70 75 80

Phe Ile Gly Pro Gly Thr Thr Leu Glu Phe Phe Ala Arg Glu Leu Pro
85 90 95

Ile Asp Asn Ile Arg Val Val Thr Asn Ser Leu Pro Val Phe Leu Ile
100 105 110

Leu Ser Glu Arg Lys Leu Thr Asp Leu Ile Leu Ile Gly Gly Asn Tyr
115 120 125

Arg Asp Ile Thr Gly Ala Phe Val Gly Thr Leu Thr Leu Gln Asn Leu
130 135 140

Ser Asn Leu Gln Phe Ser Lys Ala Phe Val Ser Cys Asn Gly Ile Gln
145 150 155 160

Asn Gly Ala Leu Ala Thr Phe Ser Glu Glu Gly Glu Ala Gln Arg
165 170 175

Ile Ala Leu Asn Asn Ser Asn Lys Lys Tyr Leu Leu Ala Asp His Ser
180 185 190

Lys Phe Asn Lys Phe Asp Phe Tyr Thr Phe Tyr Asn Val Ser Asn Leu
195 200 205

Asp Thr Ile Val Ser Asp Ser Lys Leu Ser Asp Ser Ile Leu Phe Lys
210 215 220

Leu Ser Lys His Ile Lys Val Ile Lys Pro
225 230

<210> 37
<211> 483
<212> DNA
<213> Streptococcus pneumoniae

<400> 37
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tactatcact tgaaacagct agacaaaaca gataaagacc aagagcttaa aactgaaatt 120
caatccatct ttatcgaaca caaggaaat tatgcatttc gccgggttca tttagaacta 180
agaaaatcgta gttatctggt aaatcataaa agagtcaag gcttgatgaa agtactcaat 240
ttacaagcta aaatgcgaaa gaaaacgaaaa tattcttctc ataaaggaga cgttggtaag 300
aaggcagaga atctcattca agcccaattt gaaggctcta aaacaatgga aaagtgcac 360
acagatgtga ctgaatttgc cattccagca agtactcaaa agctttactt atcaccagtt 420
ttagatggct ttaacagcga aattattgct tttaatcttt cttgttgcgc taatttagaa 480
taa 483

<210> 38
<211> 160
<212> PRT
<213> Streptococcus pneumoniae

<400> 38
Met Thr Glu Phe Ser Leu Asp Leu Leu Leu Glu Ala Ile Lys Leu Ala
1 5 10 15

Arg Trp Thr Tyr Tyr His Leu Lys Gln Leu Asp Lys Thr Asp Lys
 20 25 30

Asp Gln Glu Leu Lys Thr Glu Ile Gln Ser Ile Phe Ile Glu His Lys
 35 40 45

Gly Asn Tyr Ala Tyr Arg Arg Val His Leu Glu Leu Arg Asn Arg Gly
 50 55 60

Tyr Leu Val Asn His Lys Arg Val Gln Gly Leu Met Lys Val Leu Asn
 65 70 75 80

Leu Gln Ala Lys Met Arg Lys Lys Arg Lys Tyr Ser Ser His Lys Gly
 85 90 95

Asp Val Gly Lys Lys Ala Glu Asn Leu Ile Gln Ala Gln Phe Glu Gly
 100 105 110

Ser Lys Thr Met Glu Lys Cys Tyr Thr Asp Val Thr Glu Phe Ala Ile
 115 120 125

Pro Ala Ser Thr Gln Lys Leu Tyr Leu Ser Pro Val Leu Asp Gly Phe
 130 135 140

Asn Ser Glu Ile Ile Ala Phe Asn Leu Ser Cys Ser Pro Asn Leu Glu
 145 150 155 160

<210> 39

<211> 1266

<212> DNA

<213> Streptococcus pneumoniae

<400> 39

ccaggatttg gtaccgttgc aagtgggtgtc cctttcctcc taaaggaaaa tggaggaaaa 60
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 gaaaaaaaaatc gtttgcttgc agcaggaaat gactttaact ttgttaaccaa tgtggatgat 180

attttatcg accaggatat tactatcgta gtggaaattga tggggcgtat tgagcctgct 240
aaaaccttta tcactcggtgc cttggaaagct ggaaaacacg ttgttactgc taacaaggac 300
cttttagctg tccatggcgc agaattgcta gaaatcgctc aagctaacaa ggtagcactt 360
tactacgaag cagcaggtgc tggtggttgc ccaattcttc gtacttttagc aaattcccttg 420
gcttctgata aaattacgcg cgtgcttggta gtagtcaacg gaacctccaa cttcatggtg 480
accaagatgg tggagaagg ctgggtttac gatgatgctc ttgcggaaagc acaacgtcta 540
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gttattttga gccaatttgc ctttggcatg aagattgctt ttgatgatgt agcccacaag 660
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gacaaggcgcg gtgtcggttat catcacacac aagattaata aagccccagct tggaaatgtc 1200
tcagctgaat tgaagaagggt ttcagaatttgc gaccttttgc ataccttcaa ggtgcttagga 1260
qaataa 1266

<210> 40

<211> 421

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 40

Pro Gly Phe Gly Thr Val Ala Ser Gly Val Pro Phe Leu Leu Lys Glu

1

5

10

15

Asn Gly Gly Lys Ile Asn Gln Ser Ala His Ser Asp Ile Lys Val Ala

20

25

30

Lys Val Leu Val Lys Asp Glu Asp Glu Lys Asn Arg Leu Leu Ala Ala

35

40

45

Gly Asn Asp Phe Asn Phe Val Thr Asn Val Asp Asp Ile Leu Ser Asp

50

55

60

Gln Asp Ile Thr Ile Val Val Glu Leu Met Gly Arg Ile Glu Pro Ala
65 70 75 80

Lys Thr Phe Ile Thr Arg Ala Leu Glu Ala Gly Lys His Val Val Thr
85 90 95

Ala Asn Lys Asp Leu Leu Ala Val His Gly Ala Glu Leu Leu Glu Ile
100 105 110

Ala Gln Ala Asn Lys Val Ala Leu Tyr Tyr Glu Ala Ala Val Ala Gly
115 120 125

Gly Ile Pro Ile Leu Arg Thr Leu Ala Asn Ser Leu Ala Ser Asp Lys
130 135 140

Ile Thr Arg Val Leu Gly Val Val Asn Gly Thr Ser Asn Phe Met Val
145 150 155 160

Thr Lys Met Val Glu Glu Gly Trp Ser Tyr Asp Asp Ala Leu Ala Glu
165 170 175

Ala Gln Arg Leu Gly Phe Ala Glu Ser Asp Pro Thr Asn Asp Val Asp
180 185 190

Gly Ile Asp Ala Ala Tyr Lys Met Val Ile Leu Ser Gln Phe Ala Phe
195 200 205

Gly Met Lys Ile Ala Phe Asp Asp Val Ala His Lys Gly Ile Arg Asn
210 215 220

Ile Thr Pro Glu Asp Val Ala Val Ala Gln Glu Leu Gly Tyr Val Val
225 230 235 240

Lys Leu Val Gly Ser Ile Glu Glu Thr Ser Ser Gly Ile Ala Ala Glu
245 250 255

Val Thr Pro Thr Phe Leu Pro Lys Ala His Pro Leu Ala Ser Val Asn
260 265 270

Gly Val Met Asn Ala Val Phe Val Glu Ser Ile Gly Ile Gly Glu Ser
 275 280 285

Met Tyr Tyr Gly Pro Gly Ala Gly Gln Lys Pro Thr Ala Thr Ser Val
 290 295 300

Val Ala Asp Ile Val Arg Ile Val Arg Arg Leu Asn Asp Gly Thr Ile
 305 310 315 320

Gly Lys Asp Phe Asn Glu Tyr Ser Arg Asp Leu Val Leu Ala Asn Pro
 325 330 335

Glu Asp Val Lys Ala Asn Tyr Tyr Phe Ser Ile Leu Ala Leu Asp Ser
 340 345 350

Lys Gly Gln Val Leu Lys Leu Ala Glu Ile Phe Asn Ala Gln Asp Ile
 355 360 365

Ser Phe Lys Gln Ile Leu Gln Asp Gly Lys Glu Gly Asp Lys Ala Arg
 370 375 380

Val Val Ile Ile Thr His Ile Asn Lys Ala Gln Leu Glu Asn Val
 385 390 395 400

Ser Ala Glu Leu Lys Lys Val Ser Glu Phe Asp Leu Leu Asn Thr Phe
 405 410 415

Lys Val Leu Gly Glu
 420

<210> 41
<211> 1725
<212> DNA
<213> Streptococcus pneumoniae

<400> 41
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gaccatatctt tacctcaggg agatcaaggt catctctgga tgcagattgg cctgctcctt 180
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gggatgcggg ttattcgtgc ttttggtcaa gaaaaacgag agttacagat ttttcaaacc 660
cttaaccaag tttatgctag attacaagaa aagacaggtt tctggtctag tttattaaca 720
cctctgacct atctgattgt caatgaaact cttctcgatc ttatctggca aggctatatt 780
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<210> 42

<211> 574

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 42

Met Lys His Leu Leu Ser Tyr Phe Lys Pro Tyr Ile Lys Glu Ser Ile

Leu Ala Pro Leu Phe Lys Leu Leu Glu Ala Val Phe Glu Leu Leu Val
20 25 30

Pro Met Val Ile Ala Gly Ile Val Asp Gln Ser Leu Pro Gln Gly Asp
35 40 45

Gln Gly His Leu Trp Met Gln Ile Gly Leu Leu Leu Ile Phe Ala Val
50 55 60

Ile Gly Val Leu Val Ala Leu Ile Ala Gln Phe Tyr Ser Ala Lys Ala
65 70 75 80

Ala Val Gly Ser Ala Lys Glu Leu Thr Asn Asp Leu Tyr Arg His Ile
85 90 95

Leu Ser Leu Pro Lys Asp Ser Arg Asp Arg Leu Thr Thr Ser Ser Leu
100 105 110

Val Thr Arg Leu Thr Ser Asp Thr Tyr Gln Ile Gln Thr Gly Ile Asn
115 120 125

Gln Phe Leu Arg Leu Phe Leu Arg Ala Pro Ile Ile Val Phe Gly Ala
130 135 140

Ile Phe Met Ala Tyr Arg Ile Ser Ala Glu Leu Thr Phe Trp Phe Leu
145 150 155 160

Val Leu Val Ala Ile Leu Thr Ile Val Ile Val Gly Leu Ser Arg Leu
165 170 175

Val Asn Pro Phe Tyr Ser Ser Leu Arg Lys Lys Thr Asp Gln Leu Val
180 185 190

Gln Glu Thr Arg Gln Gln Leu Gln Gly Met Arg Val Ile Arg Ala Phe
195 200 205

Gly Gln Glu Lys Arg Glu Leu Gln Ile Phe Gln Thr Leu Asn Gln Val
210 215 220

Tyr Ala Arg Leu Gln Glu Lys Thr Gly Phe Trp Ser Ser Leu Leu Thr
225 230 235 240

Pro Leu Thr Tyr Leu Ile Val Asn Gly Thr Leu Leu Val Ile Ile Trp
245 250 255

Gln Gly Tyr Ile Ser Ile Gln Gly Gly Val Leu Ser Gln Gly Ala Leu
260 265 270

Ile Ala Leu Ile Asn Tyr Leu Leu Gln Ile Leu Val Glu Leu Val Lys
275 280 285

Leu Ala Met Leu Ile Asn Ser Leu Asn Gln Ser Tyr Ile Ser Val Lys
290 295 300

Arg Ile Glu Glu Val Phe Val Glu Ala Pro Glu Asp Ile His Ser Glu
305 310 315 320

Leu Glu Gln Lys Gln Ala Thr Arg Asp Lys Val Leu Gln Val Gln Glu
325 330 335

Leu Thr Phe Thr Tyr Pro Asp Ala Ala Gln Pro Ser Leu Arg Tyr Ile
340 345 350

Ser Phe Asp Met Thr Gln Gly Gln Ile Leu Gly Ile Ile Gly Gly Thr
355 360 365

Gly Ser Gly Lys Ser Ser Leu Val Gln Leu Leu Leu Gly Leu Tyr Pro
370 375 380

Val Asp Lys Gly Asn Ile Asp Leu Tyr Gln Asn Gly Arg Ser Pro Leu
385 390 395 400

Asn Leu Glu Gln Trp Arg Ser Trp Ile Ala Tyr Val Pro Gln Lys Val
405 410 415

Glu Leu Phe Lys Gly Thr Ile Arg Ser Asn Leu Thr Leu Gly Phe Asn
420 425 430

Gln Glu Val Ser Asp Gln Glu Leu Trp Gln Ala Leu Glu Ile Ala Gln
435 440 445

Ala Lys Asp Phe Val Ser Glu Lys Glu Gly Leu Leu Asp Ala Leu Val
450 455 460

Glu Ala Gly Gly Arg Asn Phe Ser Gly Gly Gln Lys Gln Arg Leu Ser
465 470 475 480

Ile Ala Arg Ala Val Leu Arg Gln Ala Pro Phe Leu Ile Leu Asp Asp
485 490 495

Ala Thr Ser Ala Leu Asp Thr Ile Thr Glu Ser Lys Leu Leu Lys Ala
500 505 510

Ile Arg Glu Asn Phe Pro Asn Thr Ser Leu Ile Leu Ile Ser Gln Arg
515 520 525

Thr Ser Thr Leu Gln Met Ala Asp Gln Ile Leu Leu Glu Lys Gly
530 535 540

Glu Leu Leu Ala Val Gly Lys His Asp Asp Leu Met Lys Ser Ser Gln
545 550 555 560

Val Tyr Cys Glu Ile Asn Ala Ser Gln His Gly Lys Glu Asp
565 570

<210> 43

<211> 1224

<212> DNA

<213> Streptococcus pneumoniae

<400> 43

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gtcatgctct ttaatacaga atttcttgg aaggtgaccc cctttctata tatttttaggc 240
ttgggactta tgatcttgcc gattgtattt tataatccaa gcttagttgc atcaacgggt 300
gccaaaaact gggtatcaat aaatggaatt accctattcc aaccgtcaga atttatgaag 360
atatcctata tcctcatgtt ggctcggtc attgtccaat ttacaaagaa acataaggaa 420
tggagacgca cggttccgct ggacttttg ttaattttct ggatgattct ctttaccatt 480
ccagtccctag ttcttttagc acttcaaagt gacttgggga cggctttgggt tttttagcc 540
attttctcag gaatcgttt attatcaggg gtttcttggaa aaattattat cccagtattt 600
gtgactgctg taacaggagt tgctggttgc ttagctatct ttatttagcaa ggacggacga 660
gctttcttc accagattgg aatgccgacc taccaaatta atcggatttt ggcttggctc 720
aatcccttg agtttgcaca aacaacgact taccagcagg ctcaaggga gattgccatt 780
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gagtcagata tgatTTTAC ggTTATTGCA gaAGATTTG gCTTTATTGG CTCTGTCTG 900
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aaccagttct acacttataat ttccacaggt ttgattatga tggcttctt ccacatctt 1020
gagaatatcg gtgctgtgac tggactactt ccttgcacgg ggattccctt gccttcatt 1080
tcgcaagggg gatcagctat tatcagtaat ctgattggg tgggtttgc tttatcgatg 1140
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gttgttattaa aacaaattaa ataa 1224

<210> 44

<211> 407

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 44

Met Lys Arg Ser Leu Asp Ser Arg Val Asp Tyr Ser Leu Leu Leu Pro

1

5

10

15

Val Phe Phe Leu Leu Val Ile Gly Val Val Ala Ile Tyr Ile Ala Val

20

25

30

Ser His Asp Tyr Pro Asn Asn Ile Leu Pro Ile Leu Gly Gln Gln Val

35

40

45

Ala Trp Ile Ala Leu Gly Leu Val Ile Gly Phe Val Val Met Leu Phe

50

55

60

Asn Thr Glu Phe Leu Trp Lys Val Thr Pro Phe Leu Tyr Ile Leu Gly
65 70 75 80

Leu Gly Leu Met Ile Leu Pro Ile Val Phe Tyr Asn Pro Ser Leu Val
85 90 95

Ala Ser Thr Gly Ala Lys Asn Trp Val Ser Ile Asn Gly Ile Thr Leu
100 105 110

Phe Gln Pro Ser Glu Phe Met Lys Ile Ser Tyr Ile Leu Met Leu Ala
115 120 125

Arg Val Ile Val Gln Phe Thr Lys Lys His Lys Glu Trp Arg Arg Thr
130 135 140

Val Pro Leu Asp Phe Leu Leu Ile Phe Trp Met Ile Leu Phe Thr Ile
145 150 155 160

Pro Val Leu Val Leu Leu Ala Leu Gln Ser Asp Leu Gly Thr Ala Leu
165 170 175

Val Phe Val Ala Ile Phe Ser Gly Ile Val Leu Leu Ser Gly Val Ser
180 185 190

Trp Lys Ile Ile Ile Pro Val Phe Val Thr Ala Val Thr Gly Val Ala
195 200 205

Gly Phe Leu Ala Ile Phe Ile Ser Lys Asp Gly Arg Ala Phe Leu His
210 215 220

Gln Ile Gly Met Pro Thr Tyr Gln Ile Asn Arg Ile Leu Ala Trp Leu
225 230 235 240

Asn Pro Phe Glu Phe Ala Gln Thr Thr Thr Tyr Gln Gln Ala Gln Gly
245 250 255

Gln Ile Ala Ile Gly Ser Gly Gly Leu Phe Gly Gln Gly Phe Asn Ala
260 265 270

Ser Asn Leu Leu Ile Pro Val Arg Glu Ser Asp Met Ile Phe Thr Val
 275 280 285

Ile Ala Glu Asp Phe Gly Phe Ile Gly Ser Val Leu Val Ile Ala Leu
 290 295 300

Tyr Leu Met Leu Ile Tyr Arg Met Leu Lys Ile Thr Leu Lys Ser Asn
 305 310 315 320

Asn Gln Phe Tyr Thr Tyr Ile Ser Thr Gly Leu Ile Met Met Leu Leu
 325 330 335

Phe His Ile Phe Glu Asn Ile Gly Ala Val Thr Gly Leu Leu Pro Leu
 340 345 350

Thr Gly Ile Pro Leu Pro Phe Ile Ser Gln Gly Gly Ser Ala Ile Ile
 355 360 365

Ser Asn Leu Ile Gly Val Gly Leu Leu Leu Ser Met Ser Tyr Gln Thr
 370 375 380

Asn Leu Ala Glu Glu Lys Ser Gly Lys Val Pro Phe Lys Arg Lys Lys
 385 390 395 400

Val Val Leu Lys Gln Ile Lys
 405

<210> 45

<211> 1104

<212> DNA

<213> Streptococcus pneumoniae

<400> 45

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 gagaagattc tatcaaccat tgtttcaaatt ctggatccag aaaagtatga tattgatatt 120
 cttgaaatgg agcactttga caagggatat gaatctgttc caaaggatgt acgcattta 180

aaatcccttc aagattatcg ccaaaccaga tggttacgag ctttttgtg gagaatgaga 240
atttattttc caagactgac tcgtcgttt cttgtaaaag atgattatga tggtaagtt 300
tcttttacca ttatgaatcc accactgttg ttctctaaaa gaagagaagt caagaagata 360
tcttggattc atggaagtat tgaagaacct cttaaggata gctctaaaag agaatcacat 420
agaagccagt tggatgctgc gaatacaatt gttagggattt caaaaaagac cagcaattct 480
atcaaggaag ttatccaga ttatacttct aaattacaga caatctacaa tggatatgat 540
tttcagacta ttctagaaaa atctcaagag aagatcgata tcgagattgc tcctcaaagt 600
atctgtacta tcggacggat tgagggaaat aagggttctg accgtgttgt ggaagtgata 660
cgattattac accaagaggg aaaaaactat catctctatt ttatcggggc tggatgtatg 720
gaagaggaac tggaaaaaacg agtcaaagag tatgggattt aggactatgt acatttcctt 780
ggtttatcaaa aaaatccctta tcagtatcta tctcagacga aagttttttt gtctatgtct 840
aaacaagaag gttttcctgg agtgtatgtg gagggccttga gtctggact cccttttata 900
tctacggacg ttggaggggc tgaggaatta tcccaagaag gacgattttgg acaaattcatt 960
gagagcaatc aagaggcagc tcagggcatt actaattaca tgacttctgc ctcaaacttt 1020
gatgtcgatg aggctagcca attcattcaa caatttacaa ttacaaaaca aatcgaacaa 1080
gtagaaaaac tattagaggg gtag 1104

<210> 46

<211> 367

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 46

Met Val Ala Lys Lys Lys Ile Leu Phe Phe Met Trp Ser Phe Ser Leu

1 5 10

15

Gly Gly Gly Ala Glu Lys Ile Leu Ser Thr Ile Val Ser Asn Leu Asp

20 25

30

Pro Glu Lys Tyr Asp Ile Asp Ile Leu Glu Met Glu His Phe Asp Lys

35 40 45

Gly Tyr Glu Ser Val Pro Lys His Val Arg Ile Leu Lys Ser Leu Gln

50 55 60

Asp Tyr Arg Gln Thr Arg Trp Leu Arg Ala Phe Leu Trp Arg Met Arg

65 70 75 80

Ile Tyr Phe Pro Arg Leu Thr Arg Arg Leu Leu Val Lys Asp Asp Tyr
85 90 95

Asp Val Glu Val Ser Phe Thr Ile Met Asn Pro Pro Leu Leu Phe Ser
100 105 110

Lys Arg Arg Glu Val Lys Lys Ile Ser Trp Ile His Gly Ser Ile Glu
115 120 125

Glu Leu Leu Lys Asp Ser Ser Lys Arg Glu Ser His Arg Ser Gln Leu
130 135 140

Asp Ala Ala Asn Thr Ile Val Gly Ile Ser Lys Lys Thr Ser Asn Ser
145 150 155 160

Ile Lys Glu Val Tyr Pro Asp Tyr Thr Ser Lys Leu Gln Thr Ile Tyr
165 170 175

Asn Gly Tyr Asp Phe Gln Thr Ile Leu Glu Lys Ser Gln Glu Lys Ile
180 185 190

Asp Ile Glu Ile Ala Pro Gln Ser Ile Cys Thr Ile Gly Arg Ile Glu
195 200 205

Glu Asn Lys Gly Ser Asp Arg Val Val Glu Val Ile Arg Leu Leu His
210 215 220

Gln Glu Gly Lys Asn Tyr His Leu Tyr Phe Ile Gly Ala Gly Asp Met
225 230 235 240

Glu Glu Glu Leu Lys Lys Arg Val Lys Glu Tyr Gly Ile Glu Asp Tyr
245 250 255

Val His Phe Leu Gly Tyr Gln Lys Asn Pro Tyr Gln Tyr Leu Ser Gln
260 265 270

Thr Lys Val Leu Leu Ser Met Ser Lys Gln Glu Gly Phe Pro Gly Val
275 280 285

Tyr Val Glu Ala Leu Ser Leu Gly Leu Pro Phe Ile Ser Thr Asp Val
 290 295 300

Gly Gly Ala Glu Glu Leu Ser Gln Glu Gly Arg Phe Gly Gln Ile Ile
 305 310 315 320

Glu Ser Asn Gln Glu Ala Ala Gln Ala Ile Thr Asn Tyr Met Thr Ser
 325 330 335

Ala Ser Asn Phe Asp Val Asp Glu Ala Ser Gln Phe Ile Gln Gln Phe
 340 345 350

Thr Ile Thr Lys Gln Ile Glu Gln Val Glu Lys Leu Leu Glu Glu
 355 360 365

<210> 47

<211> 987

<212> DNA

<213> Streptococcus pneumoniae

<400> 47

atggaaaactg cattaattag tgtgattgtc ccagtctata atgtggcgca gtacctagaa 60
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 gatggtgcaa cagatgaaag tggtcgcttg tgtgattcaa tcgctgaaca agatgacagg 180
 gtgtcagtgc ttcataaaaaa gaacgaaga ttgtcgcaag cacgaaatga tgggatgaag 240
 caggctcacg gggatttatct gatTTTATT gactcagatg attatatcca tccagaaatg 300
 attcagagct tatatgagca attagttcaa gaagatgcgg atgtttcgag ctgtggtg 360
 atgaatgtct atgctaatga tgaaagccca cagtcagccca atcaggatga ctatTTGTC 420
 tgtgattctc aaacatttct aaaggaatac ctcataggtg aaaaaatacc tgggacgatt 480
 tgcaataagc taatcaagag acagattgca actGCCCTAT CCTTCCTAA ggggTTGATT 540
 tacgaagatg cctattacca tttgattta atcaagttgg ccaagaagta tgtggtaat 600
 actaaaccct attattacta tttccataga gggatagta ttacgaccaa accctatgca 660
 gagaaggatt tagcctatat tgatatctac caaaAGTTT ataatgaagt tgtaaaaac 720
 tATCCTGACT tgaaagaggt cgCTTTTTC agattggcct atGCCCACTT CTTATTCTG 780
 gataagatgt tgcttagatga tcagtataaa cagttgaag cctattctca gattcatcgt 840
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attagtgc tt tggccctatt cataaaatatt tccttat atc gattcttatt actgaaaaat 960
atggaaaat ctaaaaatt acattag 987

<210> 48

<211> 328

<212> PRT

<213> Streptococcus pneumoniae

<400> 48

Met Glu Thr Ala Leu Ile Ser Val Ile Val Pro Val Tyr Asn Val Ala
1 5 10 15

Gln Tyr Leu Glu Lys Ser Ile Ala Ser Ile Gln Lys Gln Thr Tyr Gln
20 25 30

Asn Leu Glu Ile Ile Leu Val Asp Asp Gly Ala Thr Asp Glu Ser Gly
35 40 45

Arg Leu Cys Asp Ser Ile Ala Glu Gln Asp Asp Arg Val Ser Val Leu
50 55 60

His Lys Lys Asn Glu Gly Leu Ser Gln Ala Arg Asn Asp Gly Met Lys
65 70 75 80

Gln Ala His Gly Asp Tyr Leu Ile Phe Ile Asp Ser Asp Asp Tyr Ile
85 90 95

His Pro Glu Met Ile Gln Ser Leu Tyr Glu Gln Leu Val Gln Glu Asp
100 105 110

Ala Asp Val Ser Ser Cys Gly Val Met Asn Val Tyr Ala Asn Asp Glu
115 120 125

Ser Pro Gln Ser Ala Asn Gln Asp Asp Tyr Phe Val Cys Asp Ser Gln
130 135 140

Thr Phe Leu Lys Glu Tyr Leu Ile Gly Glu Lys Ile Pro Gly Thr Ile
145 150 155 160

Cys Asn Lys Leu Ile Lys Arg Gln Ile Ala Thr Ala Leu Ser Phe Pro
165 170 175

Lys Gly Leu Ile Tyr Glu Asp Ala Tyr Tyr His Phe Asp Leu Ile Lys
180 185 190

Leu Ala Lys Lys Tyr Val Val Asn Thr Lys Pro Tyr Tyr Tyr Phe
195 200 205

His Arg Gly Asp Ser Ile Thr Thr Lys Pro Tyr Ala Glu Lys Asp Leu
210 215 220

Ala Tyr Ile Asp Ile Tyr Gln Lys Phe Tyr Asn Glu Val Val Lys Asn
225 230 235 240

Tyr Pro Asp Leu Lys Glu Val Ala Phe Phe Arg Leu Ala Tyr Ala His
245 250 255

Phe Phe Ile Leu Asp Lys Met Leu Leu Asp Asp Gln Tyr Lys Gln Phe
260 265 270

Glu Ala Tyr Ser Gln Ile His Arg Phe Leu Lys Gly His Ala Phe Ala
275 280 285

Ile Ser Arg Asn Pro Ile Phe Arg Lys Gly Arg Arg Ile Ser Ala Leu
290 295 300

Ala Leu Phe Ile Asn Ile Ser Leu Tyr Arg Phe Leu Leu Leu Lys Asn
305 310 315 320

Ile Glu Lys Ser Lys Lys Leu His
325

<210> 49
<211> 735
<212> DNA
<213> *Streptococcus pneumoniae*

<210> 50
<211> 244
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 50
Met Arg Ile Lys Glu Lys Thr Asn Asn Ile Asn Gly Gly Ile Lys Asn
1 5 10 15

Val Ser Lys His Tyr Gly His Ser Ile Ile Leu Lys Asp Ile Asn Phe
20 25 30

Ala Leu Asn Lys Gly Glu Ile Val Gly Leu Ala Gly Arg Asn Gly Val
35 40 45

Gly Lys Ser Thr Leu Met Lys Ile Leu Val Gln Asn Asn Gln Pro Thr
50 55 60

Ser Gly Asn Ile Ile Ser Ser Asp Asn Val Gly Tyr Leu Ile Glu Glu
65 70 75 80

Pro Lys Leu Phe Leu Ser Lys Thr Gly Leu Glu Asn Leu Lys Tyr Leu
85 90 95

Ser Asn Leu Tyr Gly Val Asp Tyr Asn Gln Glu Arg Phe Arg Cys Leu
100 105 110

Ile Gln Glu Leu Asp Leu Thr Gln Ser Ile Asn Lys Lys Val Lys Thr
115 120 125

Tyr Ser Leu Gly Thr Lys Gln Lys Leu Ala Leu Leu Leu Thr Leu Val
130 135 140

Thr Glu Pro Asp Ile Leu Ile Leu Asp Glu Pro Thr Asn Gly Leu Asp
145 150 155 160

Ile Glu Ser Ser Gln Ile Val Leu Ala Val Leu Lys Lys Leu Ala Leu
165 170 175

His Glu Asn Val Gly Ile Leu Ile Ser Ser His Lys Leu Glu Asp Ile
180 185 190

Glu Glu Ile Cys Glu Arg Val Leu Phe Leu Glu Asn Gly Leu Leu Thr
195 200 205

Phe Gln Lys Val Gly Lys Asp Ser His Asn Phe Leu Phe Glu Ile Ala
210 215 220

Phe Ser Ser Ala Thr Asp Arg Asp Ile Phe Ile Thr Lys Gln Glu Phe
225 230 235 240

Trp Asp Ile Val

<210> 51

<211> 1704

<212> DNA

<213> Streptococcus pneumoniae

<400> 51

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ggagtgattt cgacttgggc ggaaaataca ccatgtaaca ttcacttgca tgatttcggg 180
aaactggctta aagaagggtgt caaatctgca ggcgcgttggc ctgtacagtgg 240
accgttagcgg acgggatcgc tatggaaacg cctggatgc gtttctctt aacatctcg 300
gacatcatcg cgactccat cgaggcggct atgagtggc acaacgtgga tgccttcgtc 360
gctatcggtg gctgtgacaa gaacatgcct ggatctatga ttgctattgc taatatggat 420
atcccagctta ttttcgccta tggtggaaact attgcaccgg gaaatcttga tggtaaaagat 480
atcgacttgg tttctgtctt tgaaggatgc ggaaaatggaa accacggtga catgacagct 540
gaggacgtga aacgtcttga atgtaatgcc tgccttggcc ctgggggttgg 600
tatactgcta ataccatggc aactgctatc gaagttcttag ggatgagttt gccagggtca 660
tcctctcacc cagctgaatc agctgataag aaagaagata tgcggcggc aggacgtgct 720
gttgttaaga tggtaact tggctcaaaa ccatcagata tcttgactcg tgaagcctt 780
gaagatgcta tcactgtaac gatggctctc ggtggttcta caaacgcccac tcttcactt 840
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aaagtgcgtc gtcacgttgg gccagctaaatc gtcttgcact cagaagaaga tgcgttgc 1260
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cagggagata aggtggccctt cttgtatggc ggacgttgc ctgggttgc ttatggatgc 1440
gttgttggac atatcgctcc tgaagctcg gatgggtggac caattgcata tctccgtacc 1500
ggcgatatcg ttacgttgc ccaagatacc aaagaatattt ctatggccgt atccgaagaa 1560
gaacttggaaatc aacgcaaggc agaaacaacc ttgttgcaccac tttacagccg tgggttgc 1620
ggtaaaatatg cccacatcgatcatctgt tcacgcggag ccgtgacaga cttctggaaat 1680
atggacaagt caggtaaaaaa ataa 1704

<210> 52

<211> 567

<212> PRT

<213> Streptococcus pneumoniae

<400> 52

Met Thr Glu Leu Asp Lys Arg His Arg Ser Ser Ile Tyr Asp Ser Met
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Val Lys Ser Pro Asn Arg Ala Met Leu Arg Ala Thr Gly Met Thr Asp
20 25 30

Lys Asp Phe Glu Thr Ser Ile Val Gly Val Ile Ser Thr Trp Ala Glu
35 40 45

Asn Thr Pro Cys Asn Ile His Leu His Asp Phe Gly Lys Leu Ala Lys
50 55 60

Glu Gly Val Lys Ser Ala Gly Ala Trp Pro Val Gln Phe Gly Thr Ile
65 70 75 80

Thr Val Ala Asp Gly Ile Ala Met Gly Thr Pro Gly Met Arg Phe Ser
85 90 95

Leu Thr Ser Arg Asp Ile Ile Ala Asp Ser Ile Glu Ala Ala Met Ser
100 105 110

Gly His Asn Val Asp Ala Phe Val Ala Ile Gly Gly Cys Asp Lys Asn
115 120 125

Met Pro Gly Ser Met Ile Ala Ile Ala Asn Met Asp Ile Pro Ala Ile
130 135 140

Phe Ala Tyr Gly Gly Thr Ile Ala Pro Gly Asn Leu Asp Gly Lys Asp
145 150 155 160

Ile Asp Leu Val Ser Val Phe Glu Gly Ile Gly Lys Trp Asn His Gly
165 170 175

Asp Met Thr Ala Glu Asp Val Lys Arg Leu Glu Cys Asn Ala Cys Pro
180 185 190

Gly Pro Gly Gly Cys Gly Met Tyr Thr Ala Asn Thr Met Ala Thr
195 200 205

Ala Ile Glu Val Leu Gly Met Ser Leu Pro Gly Ser Ser Ser His Pro
210 215 220

Ala Glu Ser Ala Asp Lys Lys Glu Asp Ile Glu Ala Ala Gly Arg Ala
225 230 235 240

Val Val Lys Met Leu Glu Leu Gly Leu Lys Pro Ser Asp Ile Leu Thr
245 250 255

Arg Glu Ala Phe Glu Asp Ala Ile Thr Val Thr Met Ala Leu Gly Gly
260 265 270

Ser Thr Asn Ala Thr Leu His Leu Leu Ala Ile Ala His Ala Ala Asn
275 280 285

Val Asp Leu Ser Leu Glu Asp Phe Asn Thr Ile Gln Glu Arg Val Pro
290 295 300

His Leu Ala Asp Leu Lys Pro Ser Gly Gln Tyr Val Phe Gln Asp Leu
305 310 315 320

Tyr Glu Val Gly Gly Val Pro Ala Val Met Lys Tyr Leu Leu Ala Asn
325 330 335

Gly Phe Leu His Gly Asp Arg Ile Thr Cys Thr Gly Lys Thr Val Ala
340 345 350

Glu Asn Leu Ala Asp Phe Ala Asp Leu Thr Pro Gly Gln Lys Val Ile
355 360 365

Met Pro Leu Glu Asn Pro Lys Arg Ala Asp Gly Pro Leu Ile Ile Leu
370 375 380

Asn Gly Asn Leu Ala Pro Asp Gly Ala Val Ala Lys Val Ser Gly Val
385 390 395 400

Lys Val Arg Arg His Val Gly Pro Ala Lys Val Phe Asp Ser Glu Glu
405 410 415

Asp Ala Ile Gln Ala Val Leu Thr Asp Glu Ile Val Asp Gly Asp Val
420 425 430

Val Val Val Arg Phe Val Gly Pro Lys Gly Gly Pro Gly Met Pro Glu
435 440 445

Met Leu Ser Leu Ser Ser Met Ile Val Gly Lys Gly Gln Gly Asp Lys
450 455 460

Val Ala Leu Leu Thr Asp Gly Arg Phe Ser Gly Gly Thr Tyr Gly Leu
465 470 475 480

Val Val Gly His Ile Ala Pro Glu Ala Gln Asp Gly Gly Pro Ile Ala
485 490 495

Tyr Leu Arg Thr Gly Asp Ile Val Thr Val Asp Gln Asp Thr Lys Glu
500 505 510

Ile Ser Met Ala Val Ser Glu Glu Leu Glu Lys Arg Lys Ala Glu
515 520 525

Thr Thr Leu Pro Pro Leu Tyr Ser Arg Gly Val Leu Gly Lys Tyr Ala
530 535 540

His Ile Val Ser Ser Ala Ser Arg Gly Ala Val Thr Asp Phe Trp Asn
545 550 555 560

Met Asp Lys Ser Gly Lys Lys
565

<210> 53
<211> 274
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 53
atgttataat aaaaataaaag aatttaagga gaaataacaat atgtcaattt ttattggagg 60
agcatggcca tatgcaaacg gttcggttaca tattggtcac gcggcagcgc ttttaccggg 120
ggatatctt gcaagatact atcgtcagaa gggagaggaa gtttatatg tttctgaaag 180
tgattgtaat ggaaccccta tttctatcag agctaaaaaa gaaaataagt ctgtgaaaga 240
aattgctgat ttttatcata aggaatttaa tcca 274

<210> 54
<211> 91
<212> PRT
<213> Streptococcus pneumoniae

<400> 54
Cys Tyr Asn Lys Asn Lys Glu Phe Lys Glu Lys Tyr Asn Met Ser Ile
1 5 10 15

Phe Ile Gly Gly Ala Trp Pro Tyr Ala Asn Gly Ser Leu His Ile Gly
20 25 30

His Ala Ala Ala Leu Leu Pro Gly Asp Ile Leu Ala Arg Tyr Tyr Arg
 35 40 45

Gln Lys Gly Glu Glu Val Leu Tyr Val Ser Gly Ser Asp Cys Asn Gly
50 55 60

Thr	Pro	Ile	Ser	Ile	Arg	Ala	Lys	Lys	Glu	Asn	Lys	Ser	Val	Lys	Glu		
65							70							75			80

Ile Ala Asp Phe Tyr His Lys Glu Phe Asn Pro
85 90

<210> 55
<211> 1065
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 55

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acagatggct tgggtggtat ttttggtatc aaacattcag aagctgtgga tgcaccgcgc 180
gttttggctcg cttctcatat ggacgaagtt ggttttatgg tcagcgaaat caagccagat 240
ggtagccctcc gtgtcgtaga aatcggtggc tggaaaccca tgggtggtag cagccaaacgt 300
ttcaaaactct tgactcgtga tggcatgaa attcctgtga tttcaggttc tgttcctccg 360
catttgactc gtggaaaggg gggaccaacc atgcoagcca ttgcccatacgat cgtttttgat 420
ggtaggttttg cggacaaggc tgaggcagaa agtttggca tccgtcctgg tgataccatt 480
gtaccagata gttctgcaat tttgacagcc aatgaaaaaa atatcatctc aaaagcttgg 540
gataaccgct acgggtgcct catggtaagc gagctagctg aagctttatc gggtaaaaaa 600
ctcggcaatg aactctatct gggttctaac gtccaaagaag aagttggctc gcgtggcgct 660
catacctcta caaccaagtt tgacccagaa gtcttcctcg cagttgattt ctcaccagca 720
ggtagatgtct acgggtggta aggcaagatt ggagatggaa ctttgattcg tttctatgat 780
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ggtagatcaactt accaataacta ctgtggtaaa ggcggAACAG atgcaggtgc agctcatctg 900
aaaaatggtg gtgtccatc aacaactatc ggtgtctgcg ctcgttatat ccattctcac 960
caaaccctct atgcaatgga tgacttccta gaagcgcaag ctttcttaca agccttggtg 1020
aagaaaattgg atcggtcaac ggttgatttg attaaacatt attaa 1065

<210> 56
<211> 354
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 56

Met	Thr	Leu	Phe
Ser	Lys	Ile	Lys
Glu	Val	Thr	Glu
Ala			Leu
			Ala

1 5 10 15

Val	Ser	Gly	His
Glu	Ala	Pro	Val
Ala	Arg	Ala	Tyr
			Leu
			Arg
			Glu
			Lys
			Leu

20 25 30

Thr Pro His Val Asp Glu Val Val Thr Asp Gly Leu Gly Gly Ile Phe
35 40 45

Gly Ile Lys His Ser Glu Ala Val Asp Ala Pro Arg Val Leu Val Ala
50 55 60

Ser His Met Asp Glu Val Gly Phe Met Val Ser Glu Ile Lys Pro Asp
65 70 75 80

Gly Thr Phe Arg Val Val Glu Ile Gly Gly Trp Asn Pro Met Val Val
85 90 95

Ser Ser Gln Arg Phe Lys Leu Leu Thr Arg Asp Gly His Glu Ile Pro
100 105 110

Val Ile Ser Gly Ser Val Pro Pro His Leu Thr Arg Gly Lys Gly Gly
115 120 125

Pro Thr Met Pro Ala Ile Ala Asp Ile Val Phe Asp Gly Gly Phe Ala
130 135 140

Asp Lys Ala Glu Ala Glu Ser Phe Gly Ile Arg Pro Gly Asp Thr Ile
145 150 155 160

Val Pro Asp Ser Ser Ala Ile Leu Thr Ala Asn Glu Lys Asn Ile Ile
165 170 175

Ser Lys Ala Trp Asp Asn Arg Tyr Gly Val Leu Met Val Ser Glu Leu
180 185 190

Ala Glu Ala Leu Ser Gly Gln Lys Leu Gly Asn Glu Leu Tyr Leu Gly
195 200 205

Ser Asn Val Gln Glu Glu Val Gly Leu Arg Gly Ala His Thr Ser Thr
210 215 220

Thr Lys Phe Asp Pro Glu Val Phe Leu Ala Val Asp Cys Ser Pro Ala
225 230 235 240

Gly Asp Val Tyr Gly Gly Gln Gly Lys Ile Gly Asp Gly Thr Leu Ile
 245 250 255

Arg Phe Tyr Asp Pro Gly His Leu Leu Leu Pro Gly Met Lys Asp Phe
 260 265 270

Leu Leu Thr Thr Ala Glu Glu Ala Gly Ile Lys Tyr Gln Tyr Tyr Cys
 275 280 285

Gly Lys Gly Gly Thr Asp Ala Gly Ala Ala His Leu Lys Asn Gly Gly
 290 295 300

Val Pro Ser Thr Thr Ile Gly Val Cys Ala Arg Tyr Ile His Ser His
 305 310 315 320

Gln Thr Leu Tyr Ala Met Asp Asp Phe Leu Glu Ala Gln Ala Phe Leu
 325 330 335

Gln Ala Leu Val Lys Lys Leu Asp Arg Ser Thr Val Asp Leu Ile Lys
 340 345 350

His Tyr

<210> 57

<211> 1182

<212> DNA

<213> Streptococcus pneumoniae

<400> 57

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 agcctatctc tgactttat cctagccact cgtctccac tactagaaag ctggttcac 180
 agtttggaga aggtctacac cgtccacaaa ttcacagcct ttctctcaat catcctacta 240
 atctttcata acttttagtat gggcggtttg tggggctctc gcttagctgc tcagttggc 300
 aatcttgcca tctatatctt tgccagcattc atccttgtcg cctatctttagg caaatacattc 360

caatacgaag cttggcgatg gattcaccgc ctgggttacc tagcctatat tttaggactc 420
 tttcacatct acatgataat gggcaatcg ttccttacat ttaatcttct aagtttctt 480
 gttggtagct atgccctttt aggcttacta gctggttttt atatcatttt tctatataa 540
 aagatttcct tcccccatact agggaaaatt acccatctca aacgcttaaa tcacgatact 600
 agagaaaattc aaatccatct tagcagacact ttcaactatc aatcaggaca atttgcctt 660
 ctaaaagattt tccaagaagg ctttgaaagt gctccgcatac cctttctat ctcaggaggt 720
 catggtcaaa ctctttactt tactgttaaa acttcaggcg accataccaa gaatatctat 780
 gataatctt aagccggcag caaagtaacc ctagacagag cttacggaca catgatcata 840
 gaagaaggac gagaaaaatca ggtttggatt gctggaggta ttgggatcac ccccttcata 900
 tcttacatcc gtgaacatcc tatttttagat aaacaggttc acttctacta tagcttccgt 960
 ggagatgaaa atgcagtcta cctagattta ctccgtaact atgctcagaa aaatccta 1020
 tttgaactcc atctaatcga cagtacgaaa gacggctatc ttaatttga aaaaaaagaa 1080
 gtgccccgaaac atgcaaccgt ctatatgtgt ggtcttattt ctatgatgaa ggcaacttgcc 1140
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<210> 58

<211> 394

<212> PRT

<213> Streptococcus pneumoniae

<400> 58

Met Glu Phe Ser Met Lys Ser Val Lys Gly Leu Leu Phe Ile Ile Ala

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5

10

15

Ser Phe Ile Leu Thr Leu Leu Thr Trp Met Asn Thr Ser Pro Gln Phe

20

25

30

Met Ile Pro Gly Leu Ala Leu Thr Ser Leu Ser Leu Thr Phe Ile Leu

35

40

45

Ala Thr Arg Leu Pro Leu Leu Glu Ser Trp Phe His Ser Leu Glu Lys

50

55

60

Val Tyr Thr Val His Lys Phe Thr Ala Phe Leu Ser Ile Ile Leu Leu

65

70

75

80

Ile Phe His Asn Phe Ser Met Gly Gly Leu Trp Gly Ser Arg Leu Ala
85 90 95

Ala Gln Phe Gly Asn Leu Ala Ile Tyr Ile Phe Ala Ser Ile Ile Leu
100 105 110

Val Ala Tyr Leu Gly Lys Tyr Ile Gln Tyr Glu Ala Trp Arg Trp Ile
115 120 125

His Arg Leu Val Tyr Leu Ala Tyr Ile Leu Gly Leu Phe His Ile Tyr
130 135 140

Met Ile Met Gly Asn Arg Leu Leu Thr Phe Asn Leu Leu Ser Phe Leu
145 150 155 160

Val Gly Ser Tyr Ala Leu Leu Gly Leu Leu Ala Gly Phe Tyr Ile Ile
165 170 175

Phe Leu Tyr Gln Lys Ile Ser Phe Pro Tyr Leu Gly Lys Ile Thr His
180 185 190

Leu Lys Arg Leu Asn His Asp Thr Arg Glu Ile Gln Ile His Leu Ser
195 200 205

Arg Pro Phe Asn Tyr Gln Ser Gly Gln Phe Ala Phe Leu Lys Ile Phe
210 215 220

Gln Glu Gly Phe Glu Ser Ala Pro His Pro Phe Ser Ile Ser Gly Gly
225 230 235 240

His Gly Gln Thr Leu Tyr Phe Thr Val Lys Thr Ser Gly Asp His Thr
245 250 255

Lys Asn Ile Tyr Asp Asn Leu Gln Ala Gly Ser Lys Val Thr Leu Asp
260 265 270

Arg Ala Tyr Gly His Met Ile Ile Glu Glu Gly Arg Glu Asn Gln Val
275 280 285

Trp Ile Ala Gly Gly Ile Gly Ile Thr Pro Phe Ile Ser Tyr Ile Arg
 290 295 300

Glu His Pro Ile Leu Asp Lys Gln Val His Phe Tyr Tyr Ser Phe Arg
 305 310 315 320

Gly Asp Glu Asn Ala Val Tyr Leu Asp Leu Leu Arg Asn Tyr Ala Gln
 325 330 335

Lys Asn Pro Asn Phe Glu Leu His Leu Ile Asp Ser Thr Lys Asp Gly
 340 345 350

Tyr Leu Asn Phe Glu Gln Lys Glu Val Pro Glu His Ala Thr Val Tyr
 355 360 365

Met Cys Gly Pro Ile Ser Met Met Lys Ala Leu Ala Lys Gln Ile Lys
 370 375 380

Lys Gln Asn Pro Lys Thr Glu His Ile Tyr
 385 390

<210> 59

<211> 900

<212> DNA

<213> Streptococcus pneumoniae

<400> 59

atgactttta aatcaggctt tggtagccatt tttaggacgtc ccaatgttgg gaagtcaacc 60
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 cgcaataaaa tcatggaat ttacacgact gataaggagc aaattgtctt tatcgacaca 180
 ccagggattc acaaggctaa aacagctctc ggagattca tggttgagtc tgcctacagt 240
 acccttcgacg aagtggacac tgtttttc atgggccttg ctgatgaagc gcgtggtaag 300
 ggggacgata tgattatcga gcgtctcaag gctgccaagg ttcctgtgat tttgggtggtg 360
 aataaaatcg ataaggtcca tccagaccag ctcttgtctc agattgtatc cttccgtaat 420
 caaatggact ttaaggaaat tgttccaatc tcagcccttc agggaaataa cgtgtctcggt 480
 ctagtggata ttttggatc aaatctggat gaaggttcc aatatttccc gtctgatcaa 540

atcacagacc atccagaacg tttcttggtt tcagaaatgg ttgcgcagaa agtcttcac 600
 ctaactcggt aagagattcc gcattctgtt gcagtagttt tgactctat gaaacgagac 660
 gaagagacag acaagggtca catccgtgca accatcatgg tcgagcgcga tagccaaaaa 720
 gggattatca tcggtaaagg tggcgctatg cttaagaaaa tcggtagcat ggcccgctgt 780
 gatatcgaac tcatgtttagg agacaaggtc ttccctagaaa cctgggtcaa ggtcaagaaa 840
 aactggcgcg ataaaaagct agatttggct gactttggct ataatgaaa agaataactaa 900

<210> 60

<211> 299

<212> PRT

<213> Streptococcus pneumoniae

<400> 60

Met	Thr	Phe	Lys	Ser	Gly	Phe	Val	Ala	Ile	Leu	Gly	Arg	Pro	Asn	Val
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5 10 15

Gly	Lys	Ser	Thr	Phe	Leu	Asn	His	Val	Met	Gly	Gln	Lys	Ile	Ala	Ile

20 25 30

Met	Ser	Asp	Lys	Ala	Gln	Thr	Thr	Arg	Asn	Lys	Ile	Met	Gly	Ile	Tyr

35 40 45

Thr	Thr	Asp	Lys	Glu	Gln	Ile	Val	Phe	Ile	Asp	Thr	Pro	Gly	Ile	His

50 55 60

Lys	Pro	Lys	Thr	Ala	Leu	Gly	Asp	Phe	Met	Val	Glu	Ser	Ala	Tyr	Ser

65 70 75 80

Thr	Leu	Arg	Glu	Val	Asp	Thr	Val	Leu	Phe	Met	Val	Pro	Ala	Asp	Glu

85 90 95

Ala	Arg	Gly	Lys	Gly	Asp	Asp	Met	Ile	Ile	Glu	Arg	Leu	Lys	Ala	Ala

100 105 110

Lys	Val	Pro	Val	Ile	Leu	Val	Val	Asn	Lys	Ile	Asp	Lys	Val	His	Pro

115 120 125

Asp Gln Leu Leu Ser Gln Ile Asp Asp Phe Arg Asn Gln Met Asp Phe
130 135 140

Lys Glu Ile Val Pro Ile Ser Ala Leu Gln Gly Asn Asn Val Ser Arg
145 150 155 160

Leu Val Asp Ile Leu Ser Glu Asn Leu Asp Glu Gly Phe Gln Tyr Phe
165 170 175

Pro Ser Asp Gln Ile Thr Asp His Pro Glu Arg Phe Leu Val Ser Glu
180 185 190

Met Val Arg Glu Lys Val Leu His Leu Thr Arg Glu Glu Ile Pro His
195 200 205

Ser Val Ala Val Val Val Asp Ser Met Lys Arg Asp Glu Glu Thr Asp
210 215 220

Lys Val His Ile Arg Ala Thr Ile Met Val Glu Arg Asp Ser Gln Lys
225 230 235 240

Gly Ile Ile Ile Gly Lys Gly Ala Met Leu Lys Lys Ile Gly Ser
245 250 255

Met Ala Arg Arg Asp Ile Glu Leu Met Leu Gly Asp Lys Val Phe Leu
260 265 270

Glu Thr Trp Val Lys Val Lys Lys Asn Trp Arg Asp Lys Lys Leu Asp
275 280 285

Leu Ala Asp Phe Gly Tyr Asn Glu Arg Glu Tyr
290 295

<210> 61
<211> 855
<212> DNA
<213> Streptococcus pneumoniae

<400> 61

ctgcttcttg ttttacaga aggaggactt atgcctgaat tacctgaggt tgaaaccgtt 60
tgtcgtggct tagaaaaatt gattatagga aagaagattt cgagtataga aattcgctac 120
cccaagatga ttaagacgga tttggaagag tttcaaggg aattgcctag tcagattatc 180
gagtcaatgg gacgtcgtgg aaaatatttg ctttttatac tgacagacaa ggtcttgatt 240
tcccatttgc ggatggaggg caagtatttt tactatccag accaaggacc tgaacgcaag 300
catgccccatg ttttctttca ttttgaagat ggtggcacgc ttgtttatga ggatgttcgc 360
aagtttggaa ccatggaact cttgggtgcct gaccttttag acgtctactt tatttctaaa 420
aaatttaggtc ctgaaccaag cgaacaagac tttgatttac aggtctttca atctgccctt 480
gcccaagtcca aaaagcctat caaatcccat ctcctagacc agaccttggt agctggactt 540
ggcaatatct atgtggatga ggttctctgg cgagctcagg ttcatccagc tagaccttcc 600
cagactttga cagcagaaga agcgactgcc attcatgacc agaccattgc tgttttggc 660
caggctgttg aaaaaggtgg ctccaccatt cggacttata ccaatgcctt tgggaagat 720
ggaagcatgc aggactttca tcaggtctat gataagactg gtcaagaatg tgtacgctgt 780
ggtaccatca ttgagaaaat tcaacttaggc ggacgtggaa cccacttttgc tccaaactgt 840
caaaggaggg actga 855

<210> 62
<211> 284
<212> PRT
<213> Streptococcus pneumoniae

<400> 62

Met	Leu	Leu	Val	Phe	Thr	Glu	Gly	Gly	Leu	Met	Pro	Glu	Leu	Pro	Glu
1															
	5								10						15

Val	Glu	Thr	Val	Cys	Arg	Gly	Leu	Glu	Lys	Leu	Ile	Ile	Gly	Lys	Lys
	20								25						30

Ile	Ser	Ser	Ile	Glu	Ile	Arg	Tyr	Pro	Lys	Met	Ile	Lys	Thr	Asp	Leu
	35							40							45

Glu Glu Phe Gln Arg Glu Leu Pro Ser Gln Ile Ile Glu Ser Met Gly
50 55 60

Arg Arg Gly Lys Tyr Leu Leu Phe Tyr Leu Thr Asp Lys Val Leu Ile
65 70 75 80

Ser His Leu Arg Met Glu Gly Lys Tyr Phe Tyr Tyr Pro Asp Gln Gly
85 90 95

Pro Glu Arg Lys His Ala His Val Phe Phe His Phe Glu Asp Gly Gly
100 105 110

Thr Leu Val Tyr Glu Asp Val Arg Lys Phe Gly Thr Met Glu Leu Leu
115 120 125

Val Pro Asp Leu Leu Asp Val Tyr Phe Ile Ser Lys Lys Leu Gly Pro
130 135 140

Glu Pro Ser Glu Gln Asp Phe Asp Leu Gln Val Phe Gln Ser Ala Leu
145 150 155 160

Ala Lys Ser Lys Lys Pro Ile Lys Ser His Leu Leu Asp Gln Thr Leu
165 170 175

Val Ala Gly Leu Gly Asn Ile Tyr Val Asp Glu Val Leu Trp Arg Ala
180 185 190

Gln Val His Pro Ala Arg Pro Ser Gln Thr Leu Thr Ala Glu Glu Ala
195 200 205

Thr Ala Ile His Asp Gln Thr Ile Ala Val Leu Gly Gln Ala Val Glu
210 215 220

Lys Gly Gly Ser Thr Ile Arg Thr Tyr Thr Asn Ala Phe Gly Glu Asp
225 230 235 240

Gly Ser Met Gln Asp Phe His Gln Val Tyr Asp Lys Thr Gly Gln Glu
245 250 255

Cys Val Arg Cys Gly Thr Ile Ile Glu Lys Ile Gln Leu Gly Gly Arg
 260 265 270

Gly Thr His Phe Cys Pro Asn Cys Gln Arg Arg Asp
 275 280

<210> 63

<211> 633

<212> DNA

<213> Streptococcus pneumoniae

<400> 63

ttgtccaaac tgtcaaagga gggactgatg ggaaaaatca tcggaatcac tgggggaatt 60
 gcctctggta agtcaactgt gacaaatttt ctaagacagc aaggcttc agtagtgat 120
 gccgacgcag tcgtccacca actacagaaa cctgggtgtc gtctgttga ggctctagta 180
 cagcactttg ggcaagaaat cattcttcaa aacggagaac tcaatcgccc tctccctagct 240
 agtctcatct tttcaaatcc tgatgaacga gaatggctca agcaaattca aggggagatt 300
 atccgtgagg aactggctac tttgagagaa cagttggctc agacagaaga gattttcttc 360
 atggatattc ccctactttt tgagcaggac tacagcgatt ggttgctga gacttggttg 420
 gtctatgtgg accgagatgc ccaagtggaa cgcttaatga aaagggacca gttgtccaaa 480
 gatgaagctg agtctcgctc ggcagccccag tggcccttag aaaaaaaagaa agatttggcc 540
 agccaggttc ttgataataa tggcaatcag aaccagcttc ttaatcaagt gcatatcctt 600
 cttgagggag gtaggcaaga tgacagagat taa 633

<210> 64

<211> 210

<212> PRT

<213> Streptococcus pneumoniae

<400> 64

Met Ser Lys Leu Ser Lys Glu Gly Leu Met Gly Lys Ile Ile Gly Ile
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Thr Gly Gly Ile Ala Ser Gly Lys Ser Thr Val Thr Asn Phe Leu Arg
 20 25 30

Gln Gln Gly Phe Gln Val Val Asp Ala Asp Ala Val Val His Gln Leu
35 40 45

Gln Lys Pro Gly Gly Arg Leu Phe Glu Ala Leu Val Gln His Phe Gly
50 55 60

Gln Glu Ile Ile Leu Glu Asn Gly Glu Leu Asn Arg Pro Leu Leu Ala
65 70 75 80

Ser Leu Ile Phe Ser Asn Pro Asp Glu Arg Glu Trp Ser Lys Gln Ile
85 90 95

Gln Gly Glu Ile Ile Arg Glu Glu Leu Ala Thr Leu Arg Glu Gln Leu
100 105 110

Ala Gln Thr Glu Glu Ile Phe Phe Met Asp Ile Pro Leu Leu Phe Glu
115 120 125

Gln Asp Tyr Ser Asp Trp Phe Ala Glu Thr Trp Leu Val Tyr Val Asp
130 135 140

Arg Asp Ala Gln Val Glu Arg Leu Met Lys Arg Asp Gln Leu Ser Lys
145 150 155 160

Asp Glu Ala Glu Ser Arg Leu Ala Ala Gln Trp Pro Leu Glu Lys Lys
165 170 175

Lys Asp Leu Ala Ser Gln Val Leu Asp Asn Asn Gly Asn Gln Asn Gln
180 185 190

Leu Leu Asn Gln Val His Ile Leu Leu Glu Gly Gly Arg Gln Asp Asp
195 200 205

Arg Asp
210

<210> 65

<211> 1269

<212> DNA

<213> Streptococcus pneumoniae

<400> 65

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 gtaggcaaga tgacagagat taactggaag gataatctgc gcattgcctg gtttggtaat 120
 tttctgacag gagccagtat ttctttgggt gtaccttta tgccccatctt cgtggaaaat 180
 ctaggtgtag ggagtcagca agtcgcttt tatgcaggct tagcaatttc tgtctctgct 240
 atttccgcgg cgctcttttc tcctatting ggtattcttg ctgacaaata cggccgaaaa 300
 cccatgatga ttcgggcagg tcttgctatg actatcacta tgggaggcctt ggcctttgtc 360
 ccaaatatct attggtaat ctttcttcgt ttactaaacg gtgtatttgc aggtttgtt 420
 cctaattgca cggcactgat agccagtcag gttccaaagg agaaaatcagg ctctgcctt 480
 ggtactttgt ctacaggcgt agttgcaggt actctaactg gtccctttat tggggcctt 540
 atcgcagaat tatttggcat tcgtacagtt ttcttactgg ttggtagttt tctattttta 600
 gctgctattt tgactatting ctttatcaag gaagatttc aaccagtagc caaggaaaaag 660
 gctattccaa caaaggaaatt atttacctcg gttaaatatc cctatcttt gctcaatctc 720
 ttttaacca gttttgtcat ccaattttca gctcaatcga ttggccctat tttggctt 780
 tatgtacgcg acttagggca gacagagaat cttcttttg tctctgggtt gattgtgtcc 840
 agtatgggct tttccagcat gatgagtgca ggagtcatgg gcaagctagg tgacaagggtg 900
 gccaatcatc gtctcttggt tgtcgcccag ttttattcag tcatcatcta tctcccttgt 960
 gccaatgcct cttagccccct tcaacttagga ctctatcggt tcctctttgg attgggaacc 1020
 ggtgccttga ttcccggtt taatgcccta ctcagcaaaa tgactccaa agccggcatt 1080
 tcgagggctt ttgccttcaa tcaggtattc ttttatctgg gaggtgttgt tggcccatg 1140
 gcaggttctg cagtagcagg tcaatttggc taccatgctg tcttttatgc gacaagcctt 1200
 tgggttgcct ttagttgtct cttaacctg attcaatttc gaacatttatt aaaagtaaag 1260
 gaaatctag 1269

<210> 66

<211> 422

<212> PRT

<213> Streptococcus pneumoniae

<400> 66

Met Ile Ile Met Ala Ile Arg Thr Ser Phe Leu Ile Lys Cys Ile Ser

1

5

10

15

Phe Leu Arg Glu Val Gly Lys Met Thr Glu Ile Asn Trp Lys Asp Asn
20 25 30

Leu Arg Ile Ala Trp Phe Gly Asn Phe Leu Thr Gly Ala Ser Ile Ser
35 40 45

Leu Val Val Pro Phe Met Pro Ile Phe Val Glu Asn Leu Gly Val Gly
50 55 60

Ser Gln Gln Val Ala Phe Tyr Ala Gly Leu Ala Ile Ser Val Ser Ala
65 70 75 80

Ile Ser Ala Ala Leu Phe Ser Pro Ile Trp Gly Ile Leu Ala Asp Lys
85 90 95

Tyr Gly Arg Lys Pro Met Met Ile Arg Ala Gly Leu Ala Met Thr Ile
100 105 110

Thr Met Gly Gly Leu Ala Phe Val Pro Asn Ile Tyr Trp Leu Ile Phe
115 120 125

Leu Arg Leu Leu Asn Gly Val Phe Ala Gly Phe Val Pro Asn Ala Thr
130 135 140

Ala Leu Ile Ala Ser Gln Val Pro Lys Glu Lys Ser Gly Ser Ala Leu
145 150 155 160

Gly Thr Leu Ser Thr Gly Val Val Ala Gly Thr Leu Thr Gly Pro Phe
165 170 175

Ile Gly Gly Phe Ile Ala Glu Leu Phe Gly Ile Arg Thr Val Phe Leu
180 185 190

Leu Val Gly Ser Phe Leu Phe Leu Ala Ala Ile Leu Thr Ile Cys Phe
195 200 205

Ile Lys Glu Asp Phe Gln Pro Val Ala Lys Glu Lys Ala Ile Pro Thr
210 215 220

Lys Glu Leu Phe Thr Ser Val Lys Tyr Pro Tyr Leu Leu Leu Asn Leu
225 230 235 240

Phe Leu Thr Ser Phe Val Ile Gln Phe Ser Ala Gln Ser Ile Gly Pro
245 250 255

Ile Leu Ala Leu Tyr Val Arg Asp Leu Gly Gln Thr Glu Asn Leu Leu
260 265 270

Phe Val Ser Gly Leu Ile Val Ser Ser Met Gly Phe Ser Ser Met Met
275 280 285

Ser Ala Gly Val Met Gly Lys Leu Gly Asp Lys Val Gly Asn His Arg
290 295 300

Leu Leu Val Val Ala Gln Phe Tyr Ser Val Ile Ile Tyr Leu Leu Cys
305 310 315 320

Ala Asn Ala Ser Ser Pro Leu Gln Leu Gly Leu Tyr Arg Phe Leu Phe
325 330 335

Gly Leu Gly Thr Gly Ala Leu Ile Pro Gly Val Asn Ala Leu Leu Ser
340 345 350

Lys Met Thr Pro Lys Ala Gly Ile Ser Arg Val Phe Ala Phe Asn Gln
355 360 365

Val Phe Phe Tyr Leu Gly Gly Val Val Gly Pro Met Ala Gly Ser Ala
370 375 380

Val Ala Gly Gln Phe Gly Tyr His Ala Val Phe Tyr Ala Thr Ser Leu
385 390 395 400

Cys Val Ala Phe Ser Cys Leu Phe Asn Leu Ile Gln Phe Arg Thr Leu
405 410 415

Leu Lys Val Lys Glu Ile

420

<210> 67

<211> 1311

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 67

<210> 68

<211> 436

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 68

Met Ala Leu Pro Thr Ile Ala Ile Val Gly Arg Pro Asn Val Gly Lys

Ser Thr Leu Phe Asn Arg Ile Ala Gly Glu Arg Ile Ser Ile Val Glu
20 25 30

Asp Val Glu Gly Val Thr Arg Asp Arg Ile Tyr Ala Thr Gly Glu Trp
35 40 45

Leu Asn Arg Ser Phe Ser Met Ile Asp Thr Gly Gly Ile Asp Asp Val
50 55 60

Asp Ala Pro Phe Met Glu Gln Ile Lys His Gln Ala Glu Ile Ala Met
65 70 75 80

Glu Glu Ala Asp Val Ile Val Phe Val Val Ser Gly Lys Glu Gly Ile
85 90 95

Thr Asp Ala Asp Glu Tyr Val Ala Arg Lys Leu Tyr Lys Thr His Lys
100 105 110

Pro Val Ile Leu Ala Val Asn Lys Val Asp Asn Pro Glu Met Arg Asn
115 120 125

Asp Ile Tyr Asp Phe Tyr Ala Leu Gly Leu Gly Glu Pro Leu Pro Ile
130 135 140

Ser Ser Val His Gly Ile Gly Thr Gly Asp Val Leu Asp Ala Ile Val
145 150 155 160

Glu Asn Leu Pro Asn Glu Tyr Glu Glu Asn Pro Asp Val Ile Lys
165 170 175

Phe Ser Leu Ile Gly Arg Pro Asn Val Gly Lys Ser Ser Leu Ile Asn
180 185 190

Ala Ile Leu Gly Glu Asp Arg Val Ile Ala Ser Pro Val Ala Gly Thr
195 200 205

Thr Arg Asp Ala Ile Asp Thr His Phe Thr Asp Thr Asp Gly Gln Glu
210 215 220

Phe Thr Met Ile Asp Thr Ala Gly Met Arg Lys Ser Gly Lys Val Tyr
225 230 235 240

Glu Asn Thr Glu Lys Tyr Ser Val Met Arg Ala Met Arg Ala Ile Asp
245 250 255

Arg Ser Asp Val Val Leu Met Val Ile Asn Ala Glu Glu Gly Ile Arg
260 265 270

Glu Tyr Asp Lys Arg Ile Ala Gly Phe Ala His Glu Ala Gly Lys Gly
275 280 285

Met Ile Ile Val Val Asn Lys Trp Asp Thr Leu Glu Lys Asp Asn His
290 295 300

Thr Met Lys Asn Trp Glu Glu Asp Ile Arg Glu Gln Phe Gln Tyr Leu
305 310 315 320

Pro Tyr Ala Pro Ile Ile Phe Val Ser Ala Leu Thr Lys Gln Arg Leu
325 330 335

His Lys Leu Pro Glu Met Ile Lys Gln Ile Ser Glu Ser Gln Asn Thr
340 345 350

Arg Ile Pro Ser Ala Val Leu Asn Asp Val Ile Met Asp Ala Ile Ala
355 360 365

Ile Asn Pro Thr Pro Thr Asp Lys Gly Lys Arg Leu Lys Ile Phe Tyr
370 375 380

Ala Thr Gln Val Ala Thr Lys Pro Pro Thr Phe Val Ile Phe Val Asn
385 390 395 400

Glu Glu Glu Leu Met His Phe Ser Tyr Leu Arg Phe Leu Glu Asn Gln
405 410 415

Ile Arg Lys Ala Phe Val Phe Glu Gly Thr Pro Ile His Leu Ile Ala
420 425 430

Arg Lys Arg Lys

435

<210> 69

<211> 714

<212> DNA

<213> Streptococcus pneumoniae

<400> 69

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 gaaattcccc aagttagactt aaatgagatt ttgacagcag cccagatggc atcatcttgg 120
 aagaatttcc aatcctactc tgtgattgtg gtacgaagtc aagagaagaa agatgccttg 180
 tatgaattgg tacctaaga agccattcgc cagtctgctg ttttccttct ctttgtcgg 240
 gatttgaacc gagcagaaaa gggagcccgta cttcataccg acacccctcca accccaagg 300
 gtggaaggtc tottgattag ttcggtcgat gcagctcttg ctggacaaaa cgcccttgg 360
 gcagctgaaa gcttgggcta tgggtgggtg attatcggtt tggttcgata caagtctgaa 420
 gaagtggcag agctctttaa cctacctgac tacacctatt ctgtcttgg gatggcactg 480
 ggtgtgccaa atcaacatca tgatatgaaa ccgagactgc cactagagaa tgggtcttt 540
 gaggaagaat accaagaaca gtcaacttag gcaatccaag cttatgaccg tggcaggct 600
 gactatgctg gggcgctgc gaccacaagc tggagtcagc gcctagcaga acagtttgg 660
 caagctgaac caagctcaac tagaaaaat cttgaacaga agaaattatt gtag 714

<210> 70

<211> 237

<212> PRT

<213> Streptococcus pneumoniae

<400> 70

Met Thr Glu Thr Ile Lys Leu Met Lys Ala His Thr Ser Val Arg Arg

1

5

10

15

Phe Lys Glu Gln Glu Ile Pro Gln Val Asp Leu Asn Glu Ile Leu Thr

20

25

30

Ala Ala Gln Met Ala Ser Ser Trp Lys Asn Phe Gln Ser Tyr Ser Val
35 40 45

Ile Val Val Arg Ser Gln Glu Lys Lys Asp Ala Leu Tyr Glu Leu Val
50 55 60

Pro Gln Glu Ala Ile Arg Gln Ser Ala Val Phe Leu Leu Phe Val Gly
65 70 75 80

Asp Leu Asn Arg Ala Glu Lys Gly Ala Arg Leu His Thr Asp Thr Phe
85 90 95

Gln Pro Gln Gly Val Glu Gly Leu Leu Ile Ser Ser Val Asp Ala Ala
100 105 110

Leu Ala Gly Gln Asn Ala Leu Leu Ala Ala Glu Ser Leu Gly Tyr Gly
115 120 125

Gly Val Ile Ile Gly Leu Val Arg Tyr Lys Ser Glu Glu Val Ala Glu
130 135 140

Leu Phe Asn Leu Pro Asp Tyr Thr Tyr Ser Val Phe Gly Met Ala Leu
145 150 155 160

Gly Val Pro Asn Gln His His Asp Met Lys Pro Arg Leu Pro Leu Glu
165 170 175

Asn Val Val Phe Glu Glu Glu Tyr Gln Glu Gln Ser Thr Glu Ala Ile
180 185 190

Gln Ala Tyr Asp Arg Val Gln Ala Asp Tyr Ala Gly Ala Arg Ala Thr
195 200 205

Thr Ser Trp Ser Gln Arg Leu Ala Glu Gln Phe Gly Gln Ala Glu Pro
210 215 220

Ser Ser Thr Arg Lys Asn Leu Glu Gln Lys Lys Leu Leu
225 230 235

<210> 71
<211> 729
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 71
atgacagaaa ttagactaga gcacgtcagt tatgcctatg gtcaggagag gatttttagag 60
gatatcaacc tacaggtgac ttcagggcga gtggtttcca tcctaggccc aagtggtgtt 120
ggaaagacca ccctctttaa tctaatcgct gggattttag aagttcagtc agggagaatt 180
gtccttgatg gtgaagaaaa tcccaagggg cgcgtaggtt atatgttgca aaaggatctg 240
ctcttgagc acaagacggt gcttgaaat atcattctgc ccctcttgat tcaaaagggtg 300
gataaggcag aagctatttc ccgagcggat aaaattcttg cgacccttcca gctgacagct 360
gtaagagaca agtatacctca tgaacttagc ggtgggatgc gccagcgtgt agccttactc 420
cgAACCTTACCC TTTTGGGCA CAAGCTCTT CTCTTAGATG AGGCCTTGT CGCCTTGGAT 480
gagatgacaa agatggact ccacgcttgg tatcttgaga ttcacaagca gttgcagacta 540
acaaccctga tcatcacgca tagtattgag gagggcctca atctcagcga ccgtatctat 600
atcttggaaaa atcgccctgg gcagattgtt tcagaaatta aactagattg gtctgaagat 660
gaggacaagg aagtccaaaa gattgcctac aaacgtcaaa ttttggcgga attaggctta 720
gataagttag 729

<210> 72
<211> 242
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 72
Met Thr Glu Ile Arg Leu Glu His Val Ser Tyr Ala Tyr Gly Gln Glu
1 5 10 15

Arg Ile Leu Glu Asp Ile Asn Leu Gln Val Thr Ser Gly Glu Val Val
 20 25 30

Ser Ile Leu Gly Pro Ser Gly Val Gly Lys Thr Thr Leu Phe Asn Leu
35 40 45

Ile Ala Gly Ile Leu Glu Val Gln Ser Gly Arg Ile Val Leu Asp Gly
50 55 60

Glu Glu Asn Pro Lys Gly Arg Val Ser Tyr Met Leu Gln Lys Asp Leu
65 70 75 80

Leu Leu Glu His Lys Thr Val Leu Gly Asn Ile Ile Leu Pro Leu Leu
85 90 95

Ile Gln Lys Val Asp Lys Ala Glu Ala Ile Ser Arg Ala Asp Lys Ile
100 105 110

Leu Ala Thr Phe Gln Leu Thr Ala Val Arg Asp Lys Tyr Pro His Glu
115 120 125

Leu Ser Gly Gly Met Arg Gln Arg Val Ala Leu Leu Arg Thr Tyr Leu
130 135 140

Phe Gly His Lys Leu Phe Leu Leu Asp Glu Ala Phe Ser Ala Leu Asp
145 150 155 160

Glu Met Thr Lys Met Glu Leu His Ala Trp Tyr Leu Glu Ile His Lys
165 170 175

Gln Leu Gln Leu Thr Thr Leu Ile Ile Thr His Ser Ile Glu Glu Ala
180 185 190

Leu Asn Leu Ser Asp Arg Ile Tyr Ile Leu Lys Asn Arg Pro Gly Gln
195 200 205

Ile Val Ser Glu Ile Lys Leu Asp Trp Ser Glu Asp Glu Asp Lys Glu
210 215 220

Val Gln Lys Ile Ala Tyr Lys Arg Gln Ile Leu Ala Glu Leu Gly Leu
225 230 235 240

Asp Lys

<210> 73

<211> 2433

<212> DNA

<213> Streptococcus pneumoniae

<400> 73

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agtgttagcag gggcaacttt aaatgattat ccgtatgaga tggaccgtt agaagagg 180
gctttggAAC tgactgaaac ggactatagc caggatgaaa cctttacgga attgccgttc 240
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actcgtagtct tggagaggGC tggTTTTCT tatgaagaca agaaagatca ggtcaagatt 420
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ggtaGACTTG aagaacgcAt gaataatAtc atcaaggata ttGAAGAAGA tggccaAGTC 900
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ccgattgggtt ctttatgtt cctaggGCt acaggtgtcg ggAAAActGA attagccaAG 1680
gctctggcAG aagtTctttt tgacgacgaa tcagcccttA tccgcttGA tatgagttag 1740
tatatggaga aatttgcAGC tagtcgtctc aacggagctc ctccaggctA tggatGat 1800

100

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<210> 74

<211> 810

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 74

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Val Ala Gly His Phe Gly Ala Arg Tyr Leu Glu Ser Trp His Leu Leu
20 25 30

Ile Ala Met Ser Asn His Ser Tyr Ser Val Ala Gly Ala Thr Leu Asn
35 40 45

Asp Tyr Pro Tyr Glu Met Asp Arg Leu Glu Glu Val Ala Leu Glu Leu
50 55 60

Thr Glu Thr Asp Tyr Ser Gln Asp Glu Thr Phe Thr Glu Leu Pro Phe
 65 70 75 80

Ser Arg Arg Leu Gln Val Leu Phe Asp Glu Ala Glu Tyr Val Ala Ser
85 90 95

Val Val His Ala Lys Val Leu Gly Thr Glu His Val Leu Tyr Ala Ile
100 105 110

Leu His Asp Ser Asn Ala Leu Ala Thr Arg Ile Leu Glu Arg Ala Gly
115 120 125

Phe Ser Tyr Glu Asp Lys Lys Asp Gln Val Lys Ile Ala Ala Leu Arg
130 135 140

Arg Asn Leu Glu Glu Arg Ala Gly Trp Thr Arg Glu Asp Leu Lys Ala
145 150 155 160

Leu Arg Gln Arg His Arg Thr Val Ala Asp Lys Gln Asn Ser Met Ala
165 170 175

Asn Met Met Gly Met Pro Gln Thr Pro Ser Gly Gly Leu Glu Asp Tyr
180 185 190

Thr His Asp Leu Thr Glu Gln Ala Arg Ser Gly Lys Leu Glu Pro Val
195 200 205

Ile Gly Arg Asp Lys Glu Ile Ser Arg Met Ile Gln Ile Leu Ser Arg
210 215 220

Lys Thr Lys Asn Asn Pro Val Leu Val Gly Asp Ala Gly Val Gly Lys
225 230 235 240

Thr Ala Leu Ala Leu Gly Leu Ala Gln Arg Ile Ala Ser Gly Asp Val
245 250 255

Pro Ala Glu Met Ala Lys Met Arg Val Leu Glu Leu Asp Leu Met Asn
260 265 270

Val Val Ala Gly Thr Arg Phe Arg Gly Asp Phe Glu Glu Arg Met Asn
275 280 285

Asn Ile Ile Lys Asp Ile Glu Glu Asp Gly Gln Val Ile Leu Phe Ile
290 295 300

Asp Glu Leu His Thr Ile Met Gly Ser Gly Ser Gly Ile Asp Ser Thr
305 310 315 320

Leu Asp Ala Ala Asn Ile Leu Lys Pro Ala Leu Ala Arg Gly Thr Leu
325 330 335

Arg Thr Val Gly Ala Thr Thr Gln Glu Glu Tyr Gln Lys His Ile Glu
340 345 350

Lys Asp Ala Ala Leu Ser Arg Arg Phe Ala Lys Val Thr Ile Glu Glu
355 360 365

Pro Ser Val Ala Asp Ser Met Thr Ile Leu Gln Gly Leu Lys Ala Thr
370 375 380

Tyr Glu Lys His His Arg Val Gln Ile Thr Asp Glu Ala Val Glu Thr
385 390 395 400

Ala Val Lys Met Ala His Arg Tyr Leu Thr Ser Arg His Leu Pro Asp
405 410 415

Ser Ala Ile Asp Leu Leu Asp Glu Ala Ala Ala Thr Val Gln Asn Lys
420 425 430

Ala Lys His Val Lys Ala Asp Asp Ser Asp Leu Ser Pro Ala Asp Lys
435 440 445

Ala Leu Met Asp Gly Lys Trp Lys Gln Ala Ala Gln Leu Ile Ala Lys
450 455 460

Glu Glu Glu Val Pro Val Tyr Lys Asp Leu Val Thr Glu Ser Asp Ile
465 470 475 480

Leu Thr Thr Leu Ser Arg Leu Ser Gly Ile Pro Val Gln Lys Leu Thr
485 490 495

Gln Thr Asp Ala Lys Lys Tyr Leu Asn Leu Glu Ala Glu Leu His Lys
500 505 510

Arg Val Ile Gly Gln Asp Gln Ala Val Ser Ser Ile Ser Arg Ala Ile
515 520 525

Arg Arg Asn Gln Ser Gly Ile Arg Ser His Lys Arg Pro Ile Gly Ser
530 535 540

Phe Met Phe Leu Gly Pro Thr Gly Val Gly Lys Thr Glu Leu Ala Lys
545 550 555 560

Ala Leu Ala Glu Val Leu Phe Asp Asp Glu Ser Ala Leu Ile Arg Phe
565 570 575

Asp Met Ser Glu Tyr Met Glu Lys Phe Ala Ala Ser Arg Leu Asn Gly
580 585 590

Ala Pro Pro Gly Tyr Val Gly Tyr Glu Glu Gly Glu Leu Thr Glu
595 600 605

Lys Val Arg Asn Lys Pro Tyr Ser Val Leu Leu Phe Asp Glu Val Glu
610 615 620

Lys Ala His Pro Asp Ile Phe Asn Val Leu Leu Gln Val Leu Asp Asp
625 630 635 640

Gly Val Leu Thr Asp Ser Lys Gly Arg Lys Val Asp Phe Ser Asn Thr
645 650 655

Ile Ile Ile Met Thr Ser Asn Leu Gly Ala Thr Ala Leu Arg Asp Asp
660 665 670

Lys Thr Val Gly Phe Gly Ala Lys Asp Ile Arg Phe Asp Gln Glu Asn
675 680 685

Met Glu Lys Arg Met Phe Glu Glu Leu Lys Lys Ala Tyr Arg Pro Glu
690 695 700

Phe Ile Asn Arg Ile Asp Glu Lys Val Val Phe His Ser Leu Ser Ser
705 710 715 720

Asp His Met Gln Glu Val Val Lys Ile Met Val Lys Pro Leu Val Ala
725 730 735

Ser Leu Thr Glu Lys Gly Ile Asp Leu Lys Leu Gln Ala Ser Ala Leu
740 745 750

Lys Leu Leu Ala Asn Gln Gly Tyr Asp Pro Glu Met Gly Ala Arg Pro
755 760 765

Leu Arg Arg Thr Leu Gln Thr Glu Val Glu Asp Lys Leu Ala Glu Leu
770 775 780

Leu Leu Lys Gly Asp Leu Val Ala Gly Ser Thr Leu Lys Ile Gly Val
785 790 795 800

Lys Ala Gly Gln Leu Lys Phe Asp Ile Ala
805 810

<210> 75
<211> 1008
<212> DNA
<213> Stre

<400> 75

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gactttatcc tagactggac accaaataacc aaccacacag ggctttatgt tgccaaggaa 180
aaagggttatt tcaaagaagc tggagtggtat gttgatttga aattgccacc agaagaaagt 240
tcttctgact tggttatcaa cggaaaggca ccatttgcag tgtatttcca agactacatg 300
gctaagaaat tgaaaaaagg agcagaatc actgcccgtt cagctattgt tgaacacaat 360
acatcaggaa tcatctctcg taaaatctgat aatgtaaagca gtccaaaaga cttgggttgt 420
aagaaatatg ggacatggaa tgacccaact gaacttgcta tggtaaaaac cttggtagaa 480
tctcaaggtg gagactttga gaagggttggaa aaagtaccaa ataacgactc aaactcaatc 540
acaccgattt ccaatggcgt ctgttataact gcttggattt actacggttt ggatggtatac 600
cttgctaaat ctcaaggtgt agatgctaac ttcatgtact tggaaagacta tgtcaaggag 660
tttgactact attcaccagt tatcatcgca aacaacgact atctgaaaaga taacaaagaa 720

gaagctcgca aagtcatcca agccatcaaa aaaggctacc aatatgccat ggaacatcca 780
 gaagaagctg cagatattct catcaagaat gcacctgaac tcaaggaaaa acgtgacttt 840
 gtcatcgaat ctcaaaaata cttgtcaaaa gaatacgcaa gcgacaagga aaaatggggt 900
 caatttgacg cagctcgctg gaatgcttc tacaaatggg ataaagaaaa tggtatcctt 960
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<210> 76

<211> 335

<212> PRT

<213> Streptococcus pneumoniae

<400> 76

Met Lys Lys Thr Trp Lys Val Phe Leu Thr Leu Val Thr Ala Leu Val
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Ala Val Val Leu Val Ala Cys Gly Gln Gly Thr Ala Ser Lys Asp Asn
 20 25 30

Lys Glu Ala Glu Leu Lys Lys Val Asp Phe Ile Leu Asp Trp Thr Pro
 35 40 45

Asn Thr Asn His Thr Gly Leu Tyr Val Ala Lys Glu Lys Gly Tyr Phe
 50 55 60

Lys Glu Ala Gly Val Asp Val Asp Leu Lys Leu Pro Pro Glu Glu Ser
 65 70 75 80

Ser Ser Asp Leu Val Ile Asn Gly Lys Ala Pro Phe Ala Val Tyr Phe
 85 90 95

Gln Asp Tyr Met Ala Lys Lys Leu Glu Lys Gly Ala Gly Ile Thr Ala
 100 105 110

Val Ala Ala Ile Val Glu His Asn Thr Ser Gly Ile Ile Ser Arg Lys
 115 120 125

Ser Asp Asn Val Ser Ser Pro Lys Asp Leu Val Gly Lys Lys Tyr Gly
130 135 140

Thr Trp Asn Asp Pro Thr Glu Leu Ala Met Leu Lys Thr Leu Val Glu
145 150 155 160

Ser Gln Gly Gly Asp Phe Glu Lys Val Glu Lys Val Pro Asn Asn Asp
165 170 175

Ser Asn Ser Ile Thr Pro Ile Ala Asn Gly Val Phe Asp Thr Ala Trp
180 185 190

Ile Tyr Tyr Gly Trp Asp Gly Ile Leu Ala Lys Ser Gln Gly Val Asp
195 200 205

Ala Asn Phe Met Tyr Leu Lys Asp Tyr Val Lys Glu Phe Asp Tyr Tyr
210 215 220

Ser Pro Val Ile Ile Ala Asn Asn Asp Tyr Leu Lys Asp Asn Lys Glu
225 230 235 240

Glu Ala Arg Lys Val Ile Gln Ala Ile Lys Lys Gly Tyr Gln Tyr Ala
245 250 255

Met Glu His Pro Glu Glu Ala Ala Asp Ile Leu Ile Lys Asn Ala Pro
260 265 270

Glu Leu Lys Glu Lys Arg Asp Phe Val Ile Glu Ser Gln Lys Tyr Leu
275 280 285

Ser Lys Glu Tyr Ala Ser Asp Lys Glu Lys Trp Gly Gln Phe Asp Ala
290 295 300

Ala Arg Trp Asn Ala Phe Tyr Lys Trp Asp Lys Glu Asn Gly Ile Leu
305 310 315 320

Lys Glu Asp Leu Thr Asp Lys Gly Phe Thr Asn Glu Phe Val Lys
325 330 335

<210> 77

<211> 762

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 77

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acacctcttg aaattctcca gcccattgtt cgtgacagag aatttctctg gcaccatagc 180
tgggcgacct tgagagtggc tttactgggg ctgattttgg gagttttgat tgcctgtctt 240
atggctgtgc tcatggatag tttgacttgg ctcaatgacc tgatttaccc tatgatggtg 300
gtcatttcaga ccattccgac cattgccata gctccttatcc tggcttggc gcttaggttat 360
gggattttgc ccaagattgt cttgattatc ttaacgacaa cctttccat catcggttagt 420
attttggacg gttttaggca ttgcgacaag gatatgctga cttgttttag tctgatggg 480
gccaaggcctt ggcaaattcct gtggcatttt aaaatccccag ttagcctgcc ttacttttat 540
gcagggtctga gggtcagtgt ctccatcgcc tttatcacaa ctgtggtatac tgagtgggtt 600
ggaggttttg aaggtcttgg tggatatatg attcagtcata aaaaactgtt tcagttatgat 660
accatgtttg ccattattat tctgggtgtcg attatcagtc ttttgggtat gaagctggtc 720
qatatcaqtq aaaaatatgt qattaaatqq aaacqttcqgt ag 762

762

<210> 78

<211> 253

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 78

Met Met Arg Asn Leu Arg Ser Ile Leu Arg Arg His Ile Ser Leu Leu

1

5

10

15

Gly Phe Leu Gly Val Leu Ser Ile Trp Gln Leu Ala Gly Phe Leu Lys
 20 25 30

20

25

30

Leu Leu Pro Lys Phe Ile Leu Pro Thr Pro Leu Glu Ile Leu Gln Pro
 35 40 45

35

Phe Val Arg Asp Arg Glu Phe Leu Trp His His Ser Trp Ala Thr Leu
50 55 60

Arg Val Ala Leu Leu Gly Leu Ile Leu Gly Val Leu Ile Ala Cys Leu
65 70 75 80

Met Ala Val Leu Met Asp Ser Leu Thr Trp Leu Asn Asp Leu Ile Tyr
85 90 95

Pro Met Met Val Val Ile Gln Thr Ile Pro Thr Ile Ala Ile Ala Pro
100 105 110

Ile Leu Val Leu Trp Leu Gly Tyr Gly Ile Leu Pro Lys Ile Val Leu
115 120 125

Ile Ile Leu Thr Thr Phe Pro Ile Ile Val Ser Ile Leu Asp Gly
130 135 140

Phe Arg His Cys Asp Lys Asp Met Leu Thr Leu Phe Ser Leu Met Arg
145 150 155 160

Ala Lys Pro Trp Gln Ile Leu Trp His Phe Lys Ile Pro Val Ser Leu
165 170 175

Pro Tyr Phe Tyr Ala Gly Leu Arg Val Ser Val Ser Tyr Ala Phe Ile
180 185 190

Thr Thr Val Val Ser Glu Trp Leu Gly Gly Phe Glu Gly Leu Gly Val
195 200 205

Tyr Met Ile Gln Ser Lys Lys Leu Phe Gln Tyr Asp Thr Met Phe Ala
210 215 220

Ile Ile Ile Leu Val Ser Ile Ile Ser Leu Leu Gly Met Lys Leu Val
225 230 235 240

Asp Ile Ser Glu Lys Tyr Val Ile Lys Trp Lys Arg Ser
245 250

<210> 79

<211> 372

<212> DNA

<213> Streptococcus pneumoniae

<400> 79

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 atcattgact ctttttggtatcatcgac catttctaa aaaatgtctt tgaattggaa 180
 gaagaactcg agtttcaatt gcttaataac caaggaaaga ttaccttcca cttttcaagt 240
 caacacctcc ctacagccat tgattttgac tttaaccatc ctttcgaccc tcgttatccc 300
 ccaagagtac tggttttaga catggacggt agagaaaacta tcctcctccc agaagaaaat 360
 gacctatattt aa 372

<210> 80

<211> 123

<212> PRT

<213> Streptococcus pneumoniae

<400> 80

Met	Ile	Phe	Asn	Pro	Ile	Cys	Cys	Met	Ile	Arg	Glu	Lys	Lys	Gly	Asp
1									10						15

Arg	Asp	Met	Ala	Phe	Thr	Asn	Thr	His	Met	Arg	Ser	Ala	Ser	Phe	Gly
									20						30

Ile	Val	Thr	Ser	Leu	Pro	Asp	Asp	Ile	Ile	Asp	Ser	Phe	Trp	Tyr	Ile
									35						45

Ile	Asp	His	Phe	Leu	Lys	Asn	Val	Phe	Glu	Leu	Glu	Glu	Leu	Glu	
									50						60

Phe	Gln	Leu	Leu	Asn	Asn	Gln	Gly	Lys	Ile	Thr	Phe	His	Phe	Ser	Ser
									65						80

Gln His Leu Pro Thr Ala Ile Asp Phe Asp Phe Asn His Pro Phe Asp

85

90

95

Pro Arg Tyr Pro Pro Arg Val Leu Val Leu Asp Met Asp Gly Arg Glu

100

105

110

Thr Ile Leu Leu Pro Glu Glu Asn Asp Leu Phe

115

120

<210> 81

<211> 1645

<212> DNA

<213> Streptococcus pneumoniae

<400> 81

acagcggtgt catttatct atttaagaa aagtaataat caattgttaa aaatagtaaa 60
aaaattggag gttctgatga aatattttgt tcctaattgag gtattcagta ttcgtaaattt 120
aaagggtgggg acttgctcggt tactattggc aatttcaattt ttgggaagcc aaggtattttt 180
atccggatgaa gttgttacta gtttttcacc gatggctaca aaagagtctt ctaatgcatt 240
tactaatgtat tttagataattt caccaactgt taatcagaat cgttctgctg aaatgattgc 300
ctctaattca accactaatg gtttagataa ttcgttaagt gttatagca tcagctctaa 360
tggtactattt cgttccaattt cacaatttgcgaa cAACAGAACA gttgaatcta cagtaacatc 420
tactaatgaa aataagagttt ataaggaaga tggtataagt gacagaatattt tcaaaaaaaga 480
atttgaagat actgctttaa gttgtaaaaga ttatggtgca gtaggtgatg ggattcatga 540
tgatcgacaa gcaattcaag atgcaataga tgctgcagctt caagggtctt gttggaggaaa 600
tgtatattttt cctgaaggaa cttatattttt aaaaaggaaattt gtttttttaa aaagtcttac 660
acacttagaa ttgaatgaga aagctacaat tctaaatggt ataaatattt agaatcaccc 720
ttccattgtt tttatgacag gtttattttac ggatgtatg gtcgtttttttt aatggggccc 780
aacagaagat attagttattt ctgggtgtac gattgtatg aacgggtctt tgaatgaaga 840
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tttgataac atgatgtatg caggtgtacg ttttacagga ttcactgatg tattaatcaa 1320
aggaaatcgc tttgataaga aagttaaagg agagagtgtta cattatcgag aaagcggagc 1380
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tgcaaaagat agtgcagaat gtttaggaaa agtatcagat attactgtaa caaaaaatgt 1560
aattaataat aattctaagg aaacagaaca accaaatattt gaattattac gagtttgta 1620
taattttagta gtctcagaga atagt 1645

<210> 82

<211> 548

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 82

Gln Arg Cys His Ser Ile Tyr Phe Lys Lys Ser Asn Asn Gln Leu Leu
1 5 10 15

Lys Ile Val Lys Lys Leu Glu Val Leu Met Lys Tyr Phe Val Pro Asn
 20 25 30

Glu Val Phe Ser Ile Arg Lys Leu Lys Val Gly Thr Cys Ser Val Leu
35 40 45

Leu Ala Ile Ser Ile Leu Gly Ser Gln Gly Ile Leu Ser Asp Glu Val
50 55 60

Val	Thr	Ser	Ser	Ser	Pro	Met	Ala	Thr	Lys	Glu	Ser	Ser	Asn	Ala	Ile		
65								70						75			80

Thr Asn Asp Leu Asp Asn Ser Pro Thr Val Asn Gln Asn Arg Ser Ala
85 90 95

Glu Met Ile Ala Ser Asn Ser Thr Thr Asn Gly Leu Asp Asn Ser Leu
100 105 110

Ser Val Asn Ser Ile Ser Ser Asn Gly Thr Ile Arg Ser Asn Ser Gln
 115 120 125

Leu Asp Asn Arg Thr Val Glu Ser Thr Val Thr Ser Thr Asn Glu Asn
130 135 140

Lys Ser Tyr Lys Glu Asp Val Ile Ser Asp Arg Ile Ile Lys Lys Glu
145 150 155 160

Phe Glu Asp Thr Ala Leu Ser Val Lys Asp Tyr Gly Ala Val Gly Asp
165 170 175

Gly Ile His Asp Asp Arg Gln Ala Ile Gln Asp Ala Ile Asp Ala Ala
180 185 190

Ala Gln Gly Leu Gly Gly Asn Val Tyr Phe Pro Glu Gly Thr Tyr
195 200 205

Leu Val Lys Glu Ile Val Phe Leu Lys Ser His Thr His Leu Glu Leu
210 215 220

Asn Glu Lys Ala Thr Ile Leu Asn Gly Ile Asn Ile Lys Asn His Pro
225 230 235 240

Ser Ile Val Phe Met Thr Gly Leu Phe Thr Asp Asp Gly Ala Gln Val
245 250 255

Glu Trp Gly Pro Thr Glu Asp Ile Ser Tyr Ser Gly Gly Thr Ile Asp
260 265 270

Met Asn Gly Ala Leu Asn Glu Glu Gly Thr Lys Ala Lys Asn Leu Pro
275 280 285

Leu Ile Asn Ser Ser Gly Ala Phe Ala Ile Gly Asn Ser Asn Asn Val
290 295 300

Thr Ile Lys Asn Val Thr Phe Lys Asp Ser Tyr Gln Gly His Ala Ile
305 310 315 320

Gln Ile Ala Gly Ser Lys Asn Val Leu Val Asp Asn Ser Arg Phe Leu
325 330 335

Gly Gln Ala Leu Pro Lys Thr Met Lys Asp Gly Gln Ile Ile Ser Lys
340 345 350

Glu Ser Ile Gln Ile Glu Pro Leu Thr Arg Lys Gly Phe Pro Tyr Ala
355 360 365

Leu Asn Asp Asp Gly Lys Ser Glu Asn Val Thr Ile Gln Asn Ser
370 375 380

Tyr Phe Gly Lys Ser Asp Lys Ser Gly Glu Leu Val Thr Ala Ile Gly
385 390 395 400

Thr His Tyr Gln Thr Leu Ser Thr Gln Asn Pro Ser Asn Ile Lys Ile
405 410 415

Gln Asn Asn His Phe Asp Asn Met Met Tyr Ala Gly Val Arg Phe Thr
420 425 430

Gly Phe Thr Asp Val Leu Ile Lys Gly Asn Arg Phe Asp Lys Lys Val
435 440 445

Lys Gly Glu Ser Val His Tyr Arg Glu Ser Gly Ala Ala Leu Val Asn
450 455 460

Ala Tyr Ser Tyr Lys Asn Thr Lys Asp Leu Leu Asp Leu Asn Lys Gln
465 470 475 480

Val Val Ile Ala Glu Asn Ile Phe Asn Ile Ala Asp Pro Lys Thr Lys
485 490 495

Ala Ile Arg Val Ala Lys Asp Ser Ala Glu Cys Leu Gly Lys Val Ser
500 505 510

Asp Ile Thr Val Thr Lys Asn Val Ile Asn Asn Asn Ser Lys Glu Thr
515 520 525

Glu Gln Pro Asn Ile Glu Leu Leu Arg Val Ser Asp Asn Leu Val Val
530 535 540

Ser Glu Asn Ser

545

<210> 83

<211> 324

<212> DNA

<213> Streptococcus pneumoniae

<400> 83

gtgatgaaag aaactcagct attaaaagg tttttgaag ttgtgtctt ggatatgatt 60
ggtaaaaaag agcggtatgg ttatgagttt gttcagactt tgcgagaggc tggatttgat 120
actatcgttc caggaactat ttatccttg ttgcaaaagt tagaaaaaaaaa tcaatggata 180
agaggcgaca tgcgccccgc gccagatggt ccagatcgga agtatttttc attaatgaaa 240
gaaggagaag agcggtgtc agtctttgg caacaatggg acgatttgag tcaaaaagta 300
gaagggatta agaatggggg ttaa 324

<210> 84

<211> 107

<212> PRT

<213> Streptococcus pneumoniae

<400> 84

Met Met Lys Glu Thr Gln Leu Leu Lys Gly Val Leu Glu Gly Cys Val

1

5

10

15

Leu Asp Met Ile Gly Gln Lys Glu Arg Tyr Gly Tyr Glu Leu Val Gln

20

25

30

Thr Leu Arg Glu Ala Gly Phe Asp Thr Ile Val Pro Gly Thr Ile Tyr

35

40

45

Pro Leu Leu Gln Lys Leu Glu Lys Asn Gln Trp Ile Arg Gly Asp Met

50

55

60

Arg Pro Ser Pro Asp Gly Pro Asp Arg Lys Tyr Phe Ser Leu Met Lys
 65 70 75 80

Glu Gly Glu Glu Arg Val Ser Val Phe Trp Gln Gln Trp Asp Asp Leu
 85 90 95

Ser Gln Lys Val Glu Gly Ile Lys Asn Gly Gly
 100 105

<210> 85

<211> 816

<212> DNA

<213> Streptococcus pneumoniae

<400> 85

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 gaagactatac tcagagagca gatctatttgc atgatgctag atttctcaga agcagaacga 180
 gatggcatga gtgcagagga ttatcttagt aagaatccta aaaaaataat gaaagagatt 240
 ctcaaggagg cacctcgcag ttctatcaa gagtccttt tgacgccaat tcttgtccctg 300
 gggattttac gttatttatca actactaatg gatTTTcta aaggccctct cttaacagtc 360
 aatttgctca catttttagg gcaacttctt attttctga ttggatttgg acttgtggcc 420
 acaattttac gaagaagttt agtccaagat tctctaaaa tggaaattgg cacttacatt 480
 gttgttggga ctatagttct tctagttgtt ttaggatatg taggaatggc aagcttcata 540
 caagaaggag cctttatat tccggctccc tggatagtt tgtctgtctt tacgatttcg 600
 ctatgtatcg gtatTTggaa ttggaaagaaa gcggctttc gtccatttgt cagttatgatt 660
 attgccatc ttgtggtggg ttctctgctc cgttattatg agtggatggg aatttcaaat 720
 gttttcccta caaaagttat tcctttagct gtcctttta ttggaaatctt tgtcttggttc 780
 cgtgggttta agaagataaa atggagtgaa gtata
 816

<210> 86

<211> 271

<212> PRT

<213> Streptococcus pneumoniae

<400> 86

Met Lys Lys Met Lys Tyr Tyr Glu Glu Thr Ser Ala Leu Leu His Glu
1 5 10 15

Phe Ser Glu Glu Asn Gln Lys Tyr Phe Glu Glu Leu Trp Glu Ser Phe
20 25 30

Asn Leu Ala Gly Phe Leu Tyr Asp Glu Asp Tyr Leu Arg Glu Gln Ile
35 40 45

Tyr Leu Met Met Leu Asp Phe Ser Glu Ala Glu Arg Asp Gly Met Ser
50 55 60

Ala Glu Asp Tyr Leu Gly Lys Asn Pro Lys Lys Ile Met Lys Glu Ile
65 70 75 80

Leu Lys Gly Ala Pro Arg Ser Ser Ile Lys Glu Ser Leu Leu Thr Pro
85 90 95

Ile Leu Val Leu Ala Val Leu Arg Tyr Tyr Gln Leu Leu Ser Asp Phe
100 105 110

Ser Lys Gly Pro Leu Leu Thr Val Asn Leu Leu Thr Phe Leu Gly Gln
115 120 125

Leu Leu Ile Phe Leu Ile Gly Phe Gly Leu Val Ala Thr Ile Leu Arg
130 135 140

Arg Ser Leu Val Gln Asp Ser Pro Lys Met Lys Ile Gly Thr Tyr Ile
145 150 155 160

Val Val Gly Thr Ile Val Leu Leu Val Val Leu Gly Tyr Val Gly Met
165 170 175

Ala Ser Phe Ile Gln Glu Gly Ala Phe Tyr Ile Pro Ala Pro Trp Asp
180 185 190

Ser Leu Ser Val Phe Thr Ile Ser Leu Val Ile Gly Ile Trp Asn Trp
 195 200 205

Lys Glu Ala Val Phe Arg Pro Phe Val Ser Met Ile Ile Ala His Leu
 210 215 220

Val Val Gly Ser Leu Leu Arg Tyr Tyr Glu Trp Met Gly Ile Ser Asn
 225 230 235 240

Val Phe Leu Thr Lys Val Ile Pro Leu Ala Val Leu Phe Ile Gly Ile
 245 250 255

Phe Val Leu Phe Arg Gly Phe Lys Lys Ile Lys Trp Ser Glu Val
 260 265 270

<210> 87

<211> 348

<212> DNA

<213> Streptococcus pneumoniae

<400> 87

ctgtttttt atttatactc aatgaaaatc aaagagcaaa ctaggaagct agccgcaggt 60
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 tttgaggttg tagatgaaac tgacgaagtc agctcaaaac actgttttga ggttgttagat 180
 gaaactgacg aagttagctc aaaacactgt tttgaggttg tagatgaaac tgacgaagtc 240
 agctcaaaac atgttttga ggttgttagat gaaactgacg aagttagctt ccatacatac 300
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<210> 88

<211> 115

<212> PRT

<213> Streptococcus pneumoniae

<400> 88

Met Phe Phe Tyr Leu Tyr Ser Met Lys Ile Lys Glu Gln Thr Arg Lys

1

5

10

15

Leu Ala Ala Gly Cys Ser Lys His Cys Phe Glu Val Val Asp Glu Thr
 20 25 30

Asp Glu Val Ser Ser Lys His Val Phe Glu Val Val Asp Glu Thr Asp
 35 40 45

Glu Val Ser Ser Lys His Cys Phe Glu Val Val Asp Glu Thr Asp Glu
 50 55 60

Val Ser Ser Lys His Cys Phe Glu Val Val Asp Glu Thr Asp Glu Val
 65 70 75 80

Ser Ser Lys His Val Phe Glu Val Val Asp Glu Thr Asp Glu Val Ser
 85 90 95

Asn His Thr Tyr Gly Arg Ala Thr Leu Thr Trp Phe Glu Glu Ile Phe
 100 105 110

Glu Glu Tyr
 115

<210> 89
 <211> 1260
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 89

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 tccctatctc gtcaagtcaa taaagatatg actaaatctc agaaaaatat tagcgtctt 180
 ttctctccta aaaaaagtaa agacgggtct tttactcaga aacaatcagc ttttacggtt 240
 tctggaaagg aagaggaagt tcctgttcaa ccgcacaaac cgcaagaatc ctgggtccaa 300
 gaggcagcta aactgaaggg agtggatagt tactatgtaa ccaattcaac gaatgccatc 360
 ttgacctatc aagataaaaa ggttgagaat gctaatttga caggtggaaa cagaacttac 420
 atggacgcgtt ttaagaatga aattattgca ggtcgtagtc tgagagagca agatttcaaa 480
 gagtttgcaa gtgtcatttt gctagatgag gaattgtcca tttagttatt tgaatctcct 540

caagaggcta ttaacaaggc tgtagaagtc aatggattta gttaccgggt cattggggtt 600
 tatactagtc cgaggctaa aagatcaaaa atatatgggt ttggtggctt gcctattact 660
 accaatatct cccttgcgtc gaattttaat gtagatgaaa tagctaata tgcgttcga 720
 gtgaatgata ccagtttaac cccaaactctg ggtccagaac tggcacgaaa aatgacagag 780
 ctgcaggct tacaacaggg agaataccag gtggcagatg agtccgttgt atttgcagaa 840
 attcaacaat cgtagtttt tatgacgacg attattagtt ccatcgagg gatttcttc 900
 tttgtggag gaactgggt catgaacatc atgctggttt cggtgacaga ggcactcgt 960
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<210> 90

<211> 419

<212> PRT

<213> Streptococcus pneumoniae

<400> 90

Met	Gln	Asn	Leu	Lys	Phe	Ala	Phe	Ser	Ser	Ile	Met	Ala	His	Lys	Met
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Arg	Ser	Leu	Leu	Thr	Met	Ile	Gly	Ile	Ile	Ile	Gly	Val	Ser	Ser	Val
20															

Val	Val	Ile	Met	Ala	Leu	Gly	Asp	Ser	Leu	Ser	Arg	Gln	Val	Asn	Lys
35															

Asp	Met	Thr	Lys	Ser	Gln	Lys	Asn	Ile	Ser	Val	Phe	Phe	Ser	Pro	Lys
50															

Lys	Ser	Lys	Asp	Gly	Ser	Phe	Thr	Gln	Lys	Gln	Ser	Ala	Phe	Thr	Val
65															

Ser	Gly	Lys	Glu	Glu	Val	Pro	Val	Glu	Pro	Pro	Lys	Pro	Gln	Glu
85														

120

Ser Trp Val Gln Glu Ala Ala Lys Leu Lys Gly Val Asp Ser Tyr Tyr
100 105 110

Val Thr Asn Ser Thr Asn Ala Ile Leu Thr Tyr Gln Asp Lys Lys Val
115 120 125

Glu Asn Ala Asn Leu Thr Gly Gly Asn Arg Thr Tyr Met Asp Ala Val
130 135 140

Lys Asn Glu Ile Ile Ala Gly Arg Ser Leu Arg Glu Gln Asp Phe Lys
145 150 155 160

Glu Phe Ala Ser Val Ile Leu Leu Asp Glu Glu Leu Ser Ile Ser Leu
165 170 175

Phe Glu Ser Pro Gln Glu Ala Ile Asn Lys Val Val Glu Val Asn Gly
180 185 190

Phe Ser Tyr Arg Val Ile Gly Val Tyr Thr Ser Pro Glu Ala Lys Arg
195 200 205

Ser Lys Ile Tyr Gly Phe Gly Gly Leu Pro Ile Thr Thr Asn Ile Ser
210 215 220

Leu Ala Ala Asn Phe Asn Val Asp Glu Ile Ala Asn Ile Val Phe Arg
225 230 235 240

Val Asn Asp Thr Ser Leu Thr Pro Thr Leu Gly Pro Glu Leu Ala Arg
245 250 255

Lys Met Thr Glu Leu Ala Gly Leu Gln Gln Gly Glu Tyr Gln Val Ala
260 265 270

Asp Glu Ser Val Val Phe Ala Glu Ile Gln Gln Ser Phe Ser Phe Met
275 280 285

Thr Thr Ile Ile Ser Ser Ile Ala Gly Ile Ser Leu Phe Val Gly Gly
290 295 300

Thr Gly Val Met Asn Ile Met Leu Val Ser Val Thr Glu Arg Thr Arg
 305 310 315 320

Glu Ile Gly Leu Arg Lys Ala Leu Gly Ala Thr Arg Ala Asn Ile Leu
 325 330 335

Ile Gln Phe Leu Ile Glu Ser Met Ile Leu Thr Leu Leu Gly Gly Leu
 340 345 350

Ile Gly Leu Thr Ile Ala Ser Gly Leu Thr Ala Leu Ala Gly Leu Leu
 355 360 365

Leu Gln Gly Leu Ile Glu Gly Ile Glu Val Gly Val Ser Ile Pro Val
 370 375 380

Ala Leu Phe Ser Leu Ala Val Ser Ala Ser Val Gly Met Ile Phe Gly
 385 390 395 400

Val Leu Pro Ala Asn Lys Ala Ser Lys Leu Asp Pro Ile Glu Ala Leu
 405 410 415

Arg Tyr Glu

<210> 91

<211> 705

<212> DNA

<213> Streptococcus pneumoniae

<400> 91

ctgatgaagc aactaattag tctaaaaaat atcttcagaa gttaccgtaa tggtgaccaa 60
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 atgggaccat ctgggtctgg taagtccact ctgatgaata cgattggcat gttggataca 180
 ccaaccagtg gagaatatta tcttgaaggt caagaagtgg ctgggcttgg tgaaaaacaa 240
 ctagctaagg tccgtaacca acaaatcggt tttgtcttc agcagttctt tcttctatcg 300
 aagctcaatg ctctgcaaaa tgtagaattg cccttgattt acgcaggagt ttcgtcttca 360

aaacgtcgca agttggctga ggaatattta gacaagggtt aattgacaga acgtagtcac 420
 catttacctt cagaattatac tggtgtcaa aagcaacgtg tagccattgc gcgtgccttg 480
 gtaaacaatc cttctattat cctagcggat gaaccgacag gagccttga taccaaaaca 540
 ggttaaccaa ttatgcaatt attgggttgat ttgaataaaag aaggaaaaac cattatcatg 600
 gtaacgcatg agcctgagat tgctgcctat gccaaacgtc agattgtcat tcgggatggg 660
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<210> 92

<211> 234

<212> PRT

<213> Streptococcus pneumoniae

<400> 92

Met Met Lys Gln Leu Ile Ser Leu Lys Asn Ile Phe Arg Ser Tyr Arg
 1 5 10 15

Asn Gly Asp Gln Glu Leu Gln Val Leu Lys Asn Ile Asn Leu Glu Val
 20 25 30

Asn Glu Gly Glu Phe Val Ala Ile Met Gly Pro Ser Gly Ser Gly Lys
 35 40 45

Ser Thr Leu Met Asn Thr Ile Gly Met Leu Asp Thr Pro Thr Ser Gly
 50 55 60

Glu Tyr Tyr Leu Glu Gly Gln Glu Val Ala Gly Leu Gly Glu Lys Gln
 65 70 75 80

Leu Ala Lys Val Arg Asn Gln Gln Ile Gly Phe Val Phe Gln Gln Phe
 85 90 95

Phe Leu Leu Ser Lys Leu Asn Ala Leu Gln Asn Val Glu Leu Pro Leu
 100 105 110

Ile Tyr Ala Gly Val Ser Ser Ser Lys Arg Arg Lys Leu Ala Glu Glu
 115 120 125

Tyr Leu Asp Lys Val Glu Leu Thr Glu Arg Ser His His Leu Pro Ser
 130 135 140

Glu Leu Ser Gly Gly Gln Lys Gln Arg Val Ala Ile Ala Arg Ala Leu
 145 150 155 160

Val Asn Asn Pro Ser Ile Ile Leu Ala Asp Glu Pro Thr Gly Ala Leu
 165 170 175

Asp Thr Lys Thr Gly Asn Gln Ile Met Gln Leu Leu Val Asp Leu Asn
 180 185 190

Lys Glu Gly Lys Thr Ile Ile Met Val Thr His Glu Pro Glu Ile Ala
 195 200 205

Ala Tyr Ala Lys Arg Gln Ile Val Ile Arg Asp Gly Val Ile Ser Ser
 210 215 220

Asp Ser Ala Gln Leu Gly Lys Glu Glu Asn
 225 230

<210> 93

<211> 1200

<212> DNA

<213> Streptococcus pneumoniae

<400> 93

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 ctaaaagatg agcctactca tcttgggtgtt gccaaggaag gaagcgtggc ctccctgtt 180
 ttattgtcag ggacagtaac agcaaaaaat gaacaatatg tttatttga tgcttagtaag 240
 ggtgatttag atgaaatcct ttttctgtg ggcgataagg tcagcgaagg gcaggcttta 300
 gtcaagtaca gtagttcaga agcgcaggcg gcctatgatt cagctagtcg agcagtagct 360
 agggcagatc gtcatatcaa tgaactcaat caagcacgaa atgaagccgc ttcaagctcc 420
 gctccacagt taccagcgcc agtaggagga gaagatgcaa cggtgcaaag cccaaactcca 480
 gtggctggaa attctgttgc ttctattgac gctcaattgg gtatgccccg tcatgcgcgt 540

gcagatgctg cggcgcaatt aagcaaggct caaagtcaat tggatgcaac aactgttctc 600
 agtaccctag agggaaactgt ggtcgaagtc aatagcaatg tttctaaatc tccaacaggg 660
 gcgagtcaag ttatggttca tattgtcagc aatgaaaatt tacaagtcaa gggagaattg 720
 tctgagtaca atctagccaa ctttctgtta ggtcaagaag taagctttac ttctaaatgt 780
 tattcctgata aaaaatggac tggaaattha agctatattt ctgactatcc taaaaacaat 840
 ggtgaagcag ctatgtccagc agccggaaat aatacagggtt ctaaataccc ttatactatt 900
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<210> 94

<211> 399

<212> PRT

<213> Streptococcus pneumoniae

<400> 94

Met	Lys	Lys	Lys	Asn	Gly	Lys	Ala	Lys	Lys	Trp	Gln	Leu	Tyr	Ala	Ala
1															

Ile	Gly	Ala	Ala	Ser	Val	Val	Val	Leu	Gly	Ala	Gly	Gly	Ile	Leu	Leu
20															

Phe	Arg	Gln	Pro	Ser	Gln	Thr	Ala	Leu	Lys	Asp	Glu	Pro	Thr	His	Leu
35															

Val	Val	Ala	Lys	Glu	Gly	Ser	Val	Ala	Ser	Ser	Val	Leu	Leu	Ser	Gly
50															

Thr	Val	Thr	Ala	Lys	Asn	Glu	Gln	Tyr	Val	Tyr	Phe	Asp	Ala	Ser	Lys
65															

Gly	Asp	Leu	Asp	Glu	Ile	Leu	Val	Ser	Val	Gly	Asp	Lys	Val	Ser	Glu
85															

Gly Gln Ala Leu Val Lys Tyr Ser Ser Ser Glu Ala Gln Ala Ala Tyr
100 105 110

Asp Ser Ala Ser Arg Ala Val Ala Arg Ala Asp Arg His Ile Asn Glu
115 120 125

Leu Asn Gln Ala Arg Asn Glu Ala Ala Ser Ala Pro Ala Pro Gln Leu
130 135 140

Pro Ala Pro Val Gly Gly Glu Asp Ala Thr Val Gln Ser Pro Thr Pro
145 150 155 160

Val Ala Gly Asn Ser Val Ala Ser Ile Asp Ala Gln Leu Gly Asp Ala
165 170 175

Arg Asp Ala Arg Ala Asp Ala Ala Gln Leu Ser Lys Ala Gln Ser
180 185 190

Gln Leu Asp Ala Thr Thr Val Leu Ser Thr Leu Glu Gly Thr Val Val
195 200 205

Glu Val Asn Ser Asn Val Ser Lys Ser Pro Thr Gly Ala Ser Gln Val
210 215 220

Met Val His Ile Val Ser Asn Glu Asn Leu Gln Val Lys Gly Glu Leu
225 230 235 240

Ser Glu Tyr Asn Leu Ala Asn Leu Ser Val Gly Gln Glu Val Ser Phe
245 250 255

Thr Ser Lys Val Tyr Pro Asp Lys Lys Trp Thr Gly Lys Leu Ser Tyr
260 265 270

Ile Ser Asp Tyr Pro Lys Asn Asn Gly Glu Ala Ala Ser Pro Ala Ala
275 280 285

Gly Asn Asn Thr Gly Ser Lys Tyr Pro Tyr Thr Ile Asp Val Thr Gly
290 295 300

Glu Val Gly Asp Leu Lys Gln Gly Phe Ser Val Asn Ile Glu Val Lys
 305 310 315 320

Ser Lys Thr Lys Ala Ile Leu Val Pro Val Ser Ser Leu Val Met Asp
 325 330 335

Asp Ser Lys Asn Tyr Val Trp Ile Val Asp Glu Gln Gln Lys Ala Lys
 340 345 350

Lys Val Glu Val Ser Leu Gly Asn Ala Asp Ala Glu Asn Gln Glu Ile
 355 360 365

Thr Ser Gly Leu Thr Asn Gly Ala Lys Val Ile Ser Asn Pro Thr Ser
 370 375 380

Ser Leu Glu Glu Gly Lys Glu Val Lys Ala Asp Glu Ala Thr Asn
 385 390 395

<210> 95
<211> 759
<212> DNA
<213> Streptococcus pneumoniae

<400> 95

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atcgctgctc cagcttttga tttgacaact gttcttgctg ttgcaaaagg ctcaaaccctt 180
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ccacaagttt tgaaagaaat cggtactgac tacgttgta tcggtcactc agaacgccgt 300
gactacttcc atgaaactga tgaagatatac aacaaaaaaag caaaagcaat ctttgcgaac 360
ggtatgcttc caatcatctg ttgtggtgaa tcacttgaaa cttacgaagc tggtaaagct 420
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caagaagtcg cagacaaagt tcgtgttcaa tacgggtt ctgttaaacc tgaaaatggt 660
gcttcataaca tggcttgccc agacgttgac ggtgcccttg taggtggtgc gtcacttgaa 720

gctgaaagct tcttggcttt gcttgacttt gtaaaaataa

759

<210> 96

<211> 252

<212> PRT

<213> Streptococcus pneumoniae

<400> 96

Met Ser Arg Lys Pro Phe Ile Ala Gly Asn Trp Lys Met Asn Lys Asn
1 5 10 15

Pro Glu Glu Ala Lys Ala Phe Val Glu Ala Val Ala Ser Lys Leu Pro
20 25 30

Ser Ser Asp Leu Val Glu Ala Gly Ile Ala Ala Pro Ala Leu Asp Leu
35 40 45

Thr Thr Val Leu Ala Val Ala Lys Gly Ser Asn Leu Lys Val Ala Ala
50 55 60

Gln Asn Cys Tyr Phe Glu Asn Ala Gly Ala Phe Thr Gly Glu Thr Ser
65 70 75 80

Pro Gln Val Leu Lys Glu Ile Gly Thr Asp Tyr Val Val Ile Gly His
85 90 95

Ser Glu Arg Arg Asp Tyr Phe His Glu Thr Asp Glu Asp Ile Asn Lys
100 105 110

Lys Ala Lys Ala Ile Phe Ala Asn Gly Met Leu Pro Ile Ile Cys Cys
115 120 125

Gly Glu Ser Leu Glu Thr Tyr Glu Ala Gly Lys Ala Ala Glu Phe Val
130 135 140

Gly Ala Gln Val Ser Ala Ala Leu Ala Gly Leu Thr Ala Glu Gln Val
145 150 155 160

Ala Ala Ser Val Ile Ala Tyr Glu Pro Ile Trp Ala Ile Gly Thr Gly
 165 170 175

Lys Ser Ala Ser Gln Asp Asp Ala Gln Lys Met Cys Lys Val Val Arg
 180 185 190

Asp Val Val Ala Ala Asp Phe Gly Gln Glu Val Ala Asp Lys Val Arg
 195 200 205

Val Gln Tyr Gly Gly Ser Val Lys Pro Glu Asn Val Ala Ser Tyr Met
 210 215 220

Ala Cys Pro Asp Val Asp Gly Ala Leu Val Gly Gly Ala Ser Leu Glu
 225 230 235 240

Ala Glu Ser Phe Leu Ala Leu Leu Asp Phe Val Lys
 245 250

<210> 97

<211> 1473

<212> DNA

<213> Streptococcus pneumoniae

<400> 97

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 tcagagcaaa atcagtcttc taataaaaacg caaacgagcg cagaagtaca gactaatgct 180
 gctgcccact gggatgggaa ttattatgta aaggatgatg gttctaaagc tcaaagtgaa 240
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 cagaatgaat ggcattggaaa ttactacctg aaatcaggtg gatatatggc ccaaaacgag 360
 tggatctatg acagtaatta caagagttgg ttttatctca agtcagatgg ggcttatgct 420
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gacgaagtga ttatggatgg tactcgctat atctttgcgg cctctggta gctcaaagaa 780
 aaaaaaagatt tgaatgtcgg ctggggttac agagatggta agcgctattt ctttaataat 840
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 ggtcgtatca atgattggaa aaaggattt gatgagaacg aagtggatgg tgtcattgtt 960
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 cctatctatt atgatgttga gaattggaa tatgtaaata agagcaagag agctccaagt 1200
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 tatcaaaatg tgtatgtcta tagctatcgt agtttattac agacgcgtt aaaacaccca 1320
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<210> 98

<211> 490

<212> PRT

<213> Streptococcus pneumoniae

<400> 98

Met	Lys	Thr	Lys	Ile	Gly	Leu	Ala	Ser	Ile	Cys	Leu	Leu	Gly	Leu	Ala
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1	5	10	15
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Thr	Ser	His	Val	Ala	Ala	Asn	Glu	Thr	Glu	Val	Ala	Lys	Thr	Ser	Gln
20															

20	25	30
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Asp	Thr	Thr	Thr	Ala	Ser	Ser	Ser	Glu	Gln	Asn	Gln	Ser	Ser	Asn
35														

35	40	45
----	----	----

Lys	Thr	Gln	Thr	Ser	Ala	Glu	Val	Gln	Thr	Asn	Ala	Ala	Ala	His	Trp
50															

50	55	60
----	----	----

Asp	Gly	Asp	Tyr	Tyr	Val	Lys	Asp	Asp	Gly	Ser	Lys	Ala	Gln	Ser	Glu
65															

65	70	75	80
----	----	----	----

Trp	Ile	Phe	Asp	Asn	Tyr	Tyr	Lys	Ala	Trp	Phe	Tyr	Ile	Asn	Ser	Asp
85															

85	90	95
----	----	----

130

Gly Arg Tyr Ser Gln Asn Glu Trp His Gly Asn Tyr Tyr Leu Lys Ser
100 105 110

Gly Gly Tyr Met Ala Gln Asn Glu Trp Ile Tyr Asp Ser Asn Tyr Lys
115 120 125

Ser Trp Phe Tyr Leu Lys Ser Asp Gly Ala Tyr Ala His Gln Glu Trp
130 135 140

Gln Leu Ile Gly Asn Lys Trp Tyr Tyr Phe Lys Lys Trp Gly Tyr Met
145 150 155 160

Ala Lys Ser Gln Trp Gln Gly Ser Tyr Phe Leu Asn Gly Gln Gly Ala
165 170 175

Met Met Gln Asn Glu Trp Leu Tyr Asp Pro Ala Tyr Ser Ala Tyr Phe
180 185 190

Tyr Leu Lys Ser Asp Gly Thr Tyr Ala Asn Gln Glu Trp Gln Lys Val
195 200 205

Gly Gly Lys Trp Tyr Tyr Phe Lys Lys Trp Gly Tyr Met Ala Arg Asn
210 215 220

Glu Trp Gln Gly Asn Tyr Tyr Leu Thr Gly Ser Gly Ala Met Ala Thr
225 230 235 240

Asp Glu Val Ile Met Asp Gly Thr Arg Tyr Ile Phe Ala Ala Ser Gly
245 250 255

Glu Leu Lys Glu Lys Lys Asp Leu Asn Val Gly Trp Val His Arg Asp
260 265 270

Gly Lys Arg Tyr Phe Phe Asn Asn Arg Glu Glu Gln Val Gly Thr Glu
275 280 285

His Ala Lys Lys Val Ile Asp Ile Ser Glu His Asn Gly Arg Ile Asn
290 295 300

Asp Trp Lys Lys Val Ile Asp Glu Asn Glu Val Asp Gly Val Ile Val
305 310 315 320

Arg Leu Gly Tyr Ser Gly Lys Glu Asp Lys Glu Leu Ala His Asn Ile
325 330 335

Lys Glu Leu Asn Arg Leu Gly Ile Pro Tyr Gly Val Tyr Leu Tyr Thr
340 345 350

Tyr Ala Glu Asn Glu Thr Asp Ala Glu Ser Asp Ala Lys Gln Thr Ile
355 360 365

Glu Leu Ile Lys Lys Tyr Asn Met Asn Leu Ser Tyr Pro Ile Tyr Tyr
370 375 380

Asp Val Glu Asn Trp Glu Tyr Val Asn Lys Ser Lys Arg Ala Pro Ser
385 390 395 400

Asp Thr Gly Thr Trp Val Lys Ile Ile Asn Lys Tyr Met Asp Thr Met
405 410 415

Lys Gln Ala Gly Tyr Gln Asn Val Tyr Val Tyr Ser Tyr Arg Ser Leu
420 425 430

Leu Gln Thr Arg Leu Lys His Pro Asp Ile Leu Lys His Val Asn Trp
435 440 445

Val Ala Ala Tyr Thr Asn Ala Leu Glu Trp Glu Asn Pro His Tyr Ser
450 455 460

Gly Lys Lys Gly Trp Gln Tyr Thr Ser Ser Glu Tyr Met Lys Gly Ile
465 470 475 480

Gln Gly Arg Val Asp Val Ser Val Trp Tyr
485 490

<210> 99

<211> 774

<212> DNA

<213> Streptococcus pneumoniae

<400> 99

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 aagttttcac ttggctttt gaccgttcta tctagtcacg tggccttctc catccctatc 420
 gtggtcttga tggtcttgcc tcgactcaag gaaatgaatg gcgacatgat tcattgcggcc 480
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 accttcttg taacaggaaa tggctttca accctatcag tcgagattha ctctcggtct 660
 cgcaaggggga tttccctttaga aatcaatgcc ctgtctgctc tagtcttct ctttagtatt 720
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<210> 100

<211> 257

<212> PRT

<213> Streptococcus pneumoniae

<400> 100

Met Lys Lys Phe Ala Asn Leu Tyr Leu Gly Leu Val Phe Leu Val Leu
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Tyr Leu Pro Ile Phe Tyr Leu Ile Gly Tyr Ala Phe Asn Ala Gly Asp
 20 25 30

Asp Met Asn Ser Phe Thr Gly Phe Ser Trp Thr His Phe Glu Thr Met
 35 40 45

Phe Gly Asp Gly Arg Leu Met Leu Ile Leu Ala Gln Thr Phe Phe Leu
 50 55 60

Ala Phe Leu Ser Ala Leu Ile Ala Thr Ile Ile Gly Thr Phe Gly Ala
65 70 75 80

Ile Tyr Ile Tyr Gln Ser Arg Lys Lys Tyr Gln Glu Ala Phe Leu Ser
85 90 95

Leu Asn Asn Ile Leu Met Val Ala Pro Asp Val Met Ile Gly Ala Ser
100 105 110

Phe Leu Ile Leu Phe Thr Gln Leu Lys Phe Ser Leu Gly Phe Leu Thr
115 120 125

Val Leu Ser Ser His Val Ala Phe Ser Ile Pro Ile Val Val Leu Met
130 135 140

Val Leu Pro Arg Leu Lys Glu Met Asn Gly Asp Met Ile His Ala Ala
145 150 155 160

Tyr Asp Leu Gly Ala Ser Gln Phe Gln Met Phe Lys Glu Ile Met Leu
165 170 175

Pro Tyr Leu Thr Pro Ser Ile Ile Thr Gly Tyr Phe Met Ala Phe Thr
180 185 190

Tyr Ser Leu Asp Asp Phe Ala Val Thr Phe Phe Val Thr Gly Asn Gly
195 200 205

Phe Ser Thr Leu Ser Val Glu Ile Tyr Ser Arg Ala Arg Lys Gly Ile
210 215 220

Ser Leu Glu Ile Asn Ala Leu Ser Ala Leu Val Phe Leu Phe Ser Ile
225 230 235 240

Ile Leu Val Val Gly Tyr Tyr Phe Ile Ser Arg Glu Lys Glu Glu Gln
245 250 255

Ala

<210> 101

<211> 1071

<212> DNA

<213> Streptococcus pneumoniae

<400> 101

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 aactggggag actatatcga tcctgaactc ttgactcagt ttacagaaga aacaggaatt 180
 caagttcagt acgagacttt tgactccaaac gaagccatgt acactaagat aaagcagggt 240
 ggaacgacct acgatattgc cattcgaagt gaatacatga ttaacaagat gaaggacgaa 300
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 tggaaagccgg agtataagaa ttctatcatg ctcttgcgtga ggtgctggga 540
 cttaggactca attccctcggtt ctacagcctc aactccaagg atctgcagca gtttggaaagag 600
 acagtggata agtctacaa actgactcca aatatcaagg ctatcggtgc ggacgagatg 660
 aagggtata tgattcagaa taatgttgca atcggcgtga ctttctctgg tgaagccagc 720
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 tatccccatgatg ttgaaaccat gaaacaccta gaagtttatg agaaatttga ccataaatgg 1020
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<210> 102

<211> 356

<212> PRT

<213> Streptococcus pneumoniae

<400> 102

Met Lys Lys Ile Tyr Ser Phe Leu Ala Gly Ile Ala Ala Ile Ile Leu

1

5

10

15

Val Leu Trp Gly Ile Ala Thr His Leu Asp Ser Lys Ile Asn Ser Arg
20 25 30

Asp Ser Gln Lys Leu Val Ile Tyr Asn Trp Gly Asp Tyr Ile Asp Pro
35 40 45

Glu Leu Leu Thr Gln Phe Thr Glu Glu Thr Gly Ile Gln Val Gln Tyr
50 55 60

Glu Thr Phe Asp Ser Asn Glu Ala Met Tyr Thr Lys Ile Lys Gln Gly
65 70 75 80

Gly Thr Thr Tyr Asp Ile Ala Ile Pro Ser Glu Tyr Met Ile Asn Lys
85 90 95

Met Lys Asp Glu Asp Leu Leu Val Pro Leu Asp Tyr Ser Lys Ile Glu
100 105 110

Gly Ile Glu Asn Ile Gly Pro Glu Phe Leu Asn Gln Ser Phe Asp Pro
115 120 125

Gly Asn Lys Phe Ser Ile Pro Tyr Phe Trp Gly Thr Leu Gly Ile Val
130 135 140

Tyr Asn Glu Thr Met Val Asp Glu Ala Pro Glu His Trp Asp Asp Leu
145 150 155 160

Trp Lys Pro Glu Tyr Lys Asn Ser Ile Met Leu Phe Asp Gly Ala Arg
165 170 175

Glu Val Leu Gly Leu Gly Leu Asn Ser Leu Gly Tyr Ser Leu Asn Ser
180 185 190

Lys Asp Leu Gln Gln Leu Glu Glu Thr Val Asp Lys Leu Tyr Lys Leu
195 200 205

Thr Pro Asn Ile Lys Ala Ile Val Ala Asp Glu Met Lys Gly Tyr Met
210 215 220

Ile Gln Asn Asn Val Ala Ile Gly Val Thr Phe Ser Gly Glu Ala Ser
225 230 235 240

Gln Met Leu Glu Lys Asn Glu Asn Leu Arg Tyr Val Val Pro Thr Glu
245 250 255

Ala Ser Asn Leu Trp Phe Asp Asn Met Val Ile Pro Lys Thr Val Lys
260 265 270

Asn Gln Asn Ser Ala Tyr Ala Phe Ile Asn Phe Met Leu Lys Pro Glu
275 280 285

Asn Ala Leu Gln Asn Ala Glu Tyr Val Gly Tyr Ser Thr Pro Asn Leu
290 295 300

Pro Ala Lys Glu Leu Leu Pro Glu Glu Thr Lys Glu Asp Lys Ala Phe
305 310 315 320

Tyr Pro Asp Val Glu Thr Met Lys His Leu Glu Val Tyr Glu Lys Phe
325 330 335

Asp His Lys Trp Thr Gly Lys Tyr Ser Asp Leu Phe Leu Gln Phe Lys
340 345 350

Met Tyr Arg Lys
355

<210> 103

<211> 1851

<212> DNA

<213> Streptococcus pneumoniae

<400> 103

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 ttgaagcaag ctattatcgc ctgttgcataa caaacaaccc acattgaata a 1851

<210> 104

<211> 616

<212> PRT

<213> Streptococcus pneumoniae

<400> 104

Met Asn Lys Lys Leu Thr Asp Tyr Val Ile Asp Leu Val Glu Ile Leu

Asn Lys Gln Gln Lys Gln Val Phe Trp Gly Ile Phe Asp Ile Phe Ser
20 25 30

Met Val Val Ser Ile Ile Val Ser Tyr Ile Leu Phe Tyr Gly Leu Ile
35 40 45

Asn Pro Ala Pro Val Asp Tyr Ile Ile Tyr Thr Ser Leu Ala Phe Leu
50 55 60

Phe Tyr Gln Leu Met Ile Gly Phe Trp Gly Leu Asn Ala Ser Ile Ser
65 70 75 80

Arg Tyr Ser Lys Ile Thr Asp Phe Met Lys Ile Phe Phe Gly Val Thr
85 90 95

Ala Ser Ser Val Leu Ser Tyr Ser Ile Cys Tyr Ala Phe Leu Pro Leu
100 105 110

Phe Ser Ile Arg Phe Ile Leu Phe Ile Leu Leu Ser Thr Phe Leu
115 120 125

Ile Leu Leu Pro Arg Ile Thr Trp Gln Leu Ile Tyr Ser Arg Arg Lys
130 135 140

Lys Gly Ser Gly Asp Gly Glu His Arg Arg Thr Phe Leu Ile Gly Ala
145 150 155 160

Gly Asp Gly Gly Ala Leu Phe Met Asp Ser Tyr Gln His Pro Thr Ser
165 170 175

Glu Leu Glu Leu Val Gly Ile Leu Asp Lys Asp Ser Lys Lys Gly
180 185 190

Gln Lys Leu Gly Gly Ile Pro Val Leu Gly Ser Tyr Asp Asn Leu Pro
195 200 205

Glu Leu Ala Lys Arg His Gln Ile Glu Arg Val Ile Val Ala Ile Pro
210 215 220

Ser Leu Asp Pro Ser Glu Tyr Glu Arg Ile Leu Gln Met Cys Asn Lys
225 230 235 240

Leu Gly Val Lys Cys Tyr Lys Met Pro Lys Val Glu Thr Val Val Gln
245 250 255

Gly Leu His Gln Ala Gly Thr Gly Phe Gln Lys Ile Asp Ile Thr Asp
260 265 270

Leu Leu Gly Arg Gln Glu Ile Arg Leu Asp Glu Ser Arg Leu Gly Ala
275 280 285

Glu Leu Thr Gly Lys Thr Ile Leu Val Thr Gly Ala Gly Gly Ser Ile
290 295 300

Gly Ser Glu Ile Cys Arg Gln Val Ser Arg Phe Asn Pro Glu Arg Ile
305 310 315 320

Val Leu Leu Gly His Gly Glu Asn Ser Ile Tyr Leu Val Tyr His Glu
325 330 335

Leu Ile Arg Lys Phe Gln Gly Ile Asp Tyr Val Pro Val Ile Ala Asp
340 345 350

Ile Gln Asp Tyr Asp Arg Leu Leu Gln Val Phe Glu Gln Tyr Lys Pro
355 360 365

Ala Ile Val Tyr His Ala Ala His Lys His Val Pro Met Met Glu
370 375 380

Arg Asn Pro Lys Glu Ala Phe Lys Asn Asn Ile Arg Gly Thr Tyr Asn
385 390 395 400

Val Ala Lys Ala Val Asp Glu Ala Lys Val Ser Lys Met Val Met Ile
405 410 415

Ser Thr Asp Lys Ala Val Asn Pro Pro Asn Val Met Gly Ala Thr Lys
420 425 430

Arg Val Ala Glu Leu Ile Val Thr Gly Phe Asn Gln Arg Ser Gln Ser
435 440 445

Thr Tyr Cys Ala Val Arg Phe Gly Asn Val Leu Gly Ser Arg Gly Ser
450 455 460

Val Ile Pro Val Phe Glu Arg Gln Ile Ala Glu Gly Gly Pro Val Thr
465 470 475 480

Val Thr Asp Phe Arg Met Thr Arg Tyr Phe Met Thr Ile Pro Glu Ala
485 490 495

Ser Arg Leu Val Ile His Ala Gly Ala Tyr Ala Lys Asp Gly Glu Val
500 505 510

Phe Ile Leu Asp Met Gly Lys Pro Val Lys Ile Tyr Asp Leu Ala Lys
515 520 525

Lys Met Val Leu Leu Ser Gly His Thr Glu Ser Glu Ile Pro Ile Val
530 535 540

Glu Val Gly Ile Arg Pro Gly Glu Lys Leu Tyr Glu Glu Leu Leu Val
545 550 555 560

Ser Thr Glu Leu Val Asp Asn Gln Val Met Asp Lys Ile Phe Val Gly
565 570 575

Lys Val Asn Val Met Pro Leu Glu Ser Ile Asn Gln Lys Ile Gly Glu
580 585 590

Phe Arg Thr Leu Ser Gly Asp Glu Leu Lys Gln Ala Ile Ile Ala Phe
595 600 605

Ala Asn Gln Thr Thr His Ile Glu
610 615

<210> 105

<211> 1338

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 105

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1338

<210> 106

<211> 445

<212> PRT

<213> Streptococcus pneumoniae

<400> 106

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Glu Ser Leu Val Ala Thr Gly Leu Ser Gln Leu Gly Val Val Ile Asp
20 25 30

Ala Asp Gly Phe Leu Pro Asp Gly Leu Leu Ser Pro Phe Thr Tyr Tyr
35 40 45

Leu Gly Tyr Glu Asp Gly Lys Pro Leu Tyr Phe Asn Gln Val Pro Val
50 55 60

Ser Asp Phe Trp Glu Ile Leu Gly Asp Asn Gln Ser Ala Cys Ile Glu
65 70 75 80

Asp Val Thr Gln Glu Arg Ala Val Ile His Tyr Ala Asp Gly Met Gln
85 90 95

Ala Arg Leu Val Lys Gln Val Asp Trp Lys Asp Leu Glu Gly Arg Val
100 105 110

Arg Gln Val Asp His Tyr Asn Arg Phe Gly Ala Cys Phe Ala Thr Thr
115 120 125

Thr Tyr Ser Ala Asp Ser Glu Pro Ile Met Thr Val Tyr Gln Asp Val
130 135 140

Asn Gly Gln Gln Val Leu Leu Glu Asn His Val Thr Gly Asp Ile Leu
145 150 155 160

Leu Thr Leu Pro Gly Gln Ser Met Arg Tyr Phe Ala Asn Lys Val Glu
165 170 175

Phe Ile Thr Phe Phe Leu Gln Asp Leu Glu Ile Asp Thr Ser Gln Leu
180 185 190

Ile Phe Asn Thr Leu Ala Thr Pro Phe Leu Val Ser Phe His His Pro
195 200 205

Asp Lys Ser Gly Ser Asp Val Leu Val Trp Gln Glu Pro Leu Tyr Asp
210 215 220

Ala Ile Pro Gly Asn Met Gln Leu Ile Leu Glu Ser Asp Asn Val Arg
225 230 235 240

Thr Lys Lys Ile Ile Pro Asn Lys Ala Thr Tyr Glu Arg Ala Leu
245 250 255

Glu Leu Thr Asp Glu Lys Tyr His Asp Gln Phe Val His Leu Gly Tyr
260 265 270

His Tyr Gln Phe Lys Arg Asp Asn Phe Leu Arg Arg Asp Ala Leu Ile
275 280 285

Leu Thr Asn Ser Asp Gln Ile Glu Gln Val Glu Ala Ile Ala Gly Ala
290 295 300

Leu Pro Asp Val Thr Phe Arg Ile Ala Ala Val Thr Glu Met Ser Ser
305 310 315 320

Lys Leu Leu Asp Met Leu Cys Tyr Pro Asn Val Ala Leu Tyr Gln Asn
325 330 335

Ala Ser Pro Gln Lys Ile Gln Glu Leu Tyr Gln Leu Ser Asp Ile Tyr
340 345 350

Leu Asp Ile Asn His Ser Asn Glu Leu Leu Gln Ala Val Arg Gln Ala
355 360 365

Phe Glu His Asn Leu Leu Ile Leu Gly Phe Asn Gln Thr Val His Asn
370 375 380

Arg Leu Tyr Ile Ala Pro Asp His Leu Phe Glu Ser Ser Glu Val Ala
 385 390 395 400

Ala Leu Val Glu Thr Ile Lys Leu Ala Leu Ser Asp Val Asp Gln Met
 405 410 415

Arg Gln Ala Leu Gly Lys Gln Gly Gln His Ala Asn Tyr Val Asp Leu
 420 425 430

Val Arg Tyr Gln Glu Thr Met Gln Thr Val Leu Gly Gly
 435 440 445

<210> 107

<211> 1512

<212> DNA

<213> Streptococcus pneumoniae

<400> 107

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 aacaaggact tggccaaca tgccgagat gttttaagg gaaacctgat tcggaaggat 420
 tactttctt atacgcgtta ttgttagcgag tatttgctc ccaaggacaa tgttgcagtc 480
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 caagggaaagg aagaagtta tcatttcaag gataagattt tctatggaaa gcaagctttt 600
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 gagacaggtt ttggacaggt tttgttttagt gaagcacaga cagcacatct agcggtagtt 720
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<210> 108

<211> 503

<212> PRT

<213> Streptococcus pneumoniae

<400> 108

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35 40 45

Gln His Leu Thr Ala Asn Ile Gly Phe Asp Asp Asn Gln Val Ile Trp
50 55 60

Leu Tyr Asn His Phe Thr Asp Ile Lys Ile Ala Pro Thr Ser Val Thr
65 70 75 80

Val Asp Asp Val Leu Ala Tyr Phe Gly Gly Glu Glu Ser His Arg Glu
85 90 95

Lys Asn Gly Lys Val Leu Arg Val Phe Phe Asp Gln Asp Lys Phe
100 105 110

Val Thr Cys Tyr Leu Val Asp Glu Asn Lys Asp Leu Val Gln His Ala
115 120 125

Glu Tyr Val Phe Lys Gly Asn Leu Ile Arg Lys Asp Tyr Phe Ser Tyr
130 135 140

Thr Arg Tyr Cys Ser Glu Tyr Phe Ala Pro Lys Asp Asn Val Ala Val
145 150 155 160

Leu Tyr Gln Arg Thr Phe Tyr Asn Glu Asp Gly Thr Pro Val Tyr Asp
165 170 175

Ile Leu Met Asn Gln Gly Lys Glu Glu Val Tyr His Phe Lys Asp Lys
180 185 190

Ile Phe Tyr Gly Lys Gln Ala Phe Val Arg Ala Phe Met Lys Ser Leu
195 200 205

Asn Leu Asn Lys Ser Asp Leu Val Ile Leu Asp Arg Glu Thr Gly Ile
210 215 220

Gly Gln Val Val Phe Glu Glu Ala Gln Thr Ala His Leu Ala Val Val
225 230 235 240

Val His Ala Glu His Tyr Ser Glu Asn Ala Thr Asn Glu Asp Tyr Ile
245 250 255

Leu Trp Asn Asn Tyr Tyr Asp Tyr Gln Phe Thr Asn Ala Asp Lys Val
260 265 270

Asp Phe Phe Ile Val Ser Thr Asp Arg Gln Asn Glu Val Leu Gln Glu
275 280 285

Gln Phe Ala Lys Tyr Thr Gln His Gln Pro Lys Ile Val Thr Ile Pro
290 295 300

Val Gly Ser Ile Asp Ser Leu Thr Asp Ser Ser Gln Gly Arg Lys Pro
305 310 315 320

Phe Ser Leu Ile Thr Ala Ser Arg Leu Ala Lys Glu Lys His Ile Asp
325 330 335

Trp Leu Val Lys Ala Val Ile Glu Ala His Lys Glu Leu Pro Glu Leu
340 345 350

Ile Ile Ala Asn His Gln Ala Glu Asp Tyr Ile Gln Leu Lys Gly His
370 375 380

Ala Glu Leu Ser Gln Ile Tyr Ser Gln Tyr Glu Val Tyr Leu Thr Ala
385 390 395 400

Ser Thr Ser Glu Gly Phe Gly Leu Thr Leu Met Glu Ala Ile Gly Ser
405 410 415

Gly Leu Pro Leu Ile Gly Phe Asp Val Pro Tyr Gly Asn Gln Thr Phe
420 425 430

Ile Glu Asp Gly Gln Asn Gly Tyr Leu Ile Pro Ser Ser Ser Asp His
435 440 445

Tyr Gln Glu Asn Arg Leu Glu Ala Met Arg Ala Tyr Ser Tyr Gln Ile
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485 490 495

Val Glu Glu Val Leu His Asp
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<210> 109

<211> 2292

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 109

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<210> 110

<211> 763

<212> PRT

<213> Streptococcus pneumoniae

<400> 110

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20

25

30

Ala	Phe	Ala	Val	Val	Arg	Glu	Ala	Asp	Lys	Arg	Ile	Leu	Gly	Met	Phe

35

40

45

Pro	Tyr	Asp	Val	Gln	Val	Met	Gly	Ala	Ile	Val	Met	His	Tyr	Gly	Asn

50

55

60

Val	Ala	Glu	Met	Asn	Thr	Gly	Glu	Gly	Lys	Thr	Leu	Thr	Ala	Thr	Met

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70

75

80

Pro	Val	Tyr	Leu	Asn	Ala	Phe	Ser	Gly	Glu	Gly	Val	Met	Val	Val	Thr

85

90

95

Pro	Asn	Glu	Tyr	Leu	Ser	Lys	Arg	Asp	Ala	Glu	Glu	Met	Gly	Gln	Val

100

105

110

Tyr	Arg	Phe	Leu	Gly	Leu	Thr	Ile	Gly	Val	Pro	Phe	Thr	Glu	Asp	Pro

115

120

125

150

Lys Lys Glu Met Lys Ala Glu Glu Lys Lys Leu Ile Tyr Ala Ser Asp
130 135 140

Ile Ile Tyr Thr Thr Asn Ser Asn Leu Gly Phe Asp Tyr Leu Asn Asp
145 150 155 160

Asn Leu Ala Ser Asn Glu Glu Gly Lys Phe Leu Arg Pro Phe Asn Tyr
165 170 175

Val Ile Ile Asp Glu Ile Asp Asp Ile Leu Leu Asp Ser Ala Gln Thr
180 185 190

Pro Leu Ile Ile Ala Gly Ser Pro Arg Val Gln Ser Asn Tyr Tyr Ala
195 200 205

Ile Ile Asp Thr Leu Val Thr Thr Leu Val Glu Gly Glu Asp Tyr Ile
210 215 220

Phe Lys Glu Glu Lys Glu Glu Val Trp Leu Thr Thr Lys Gly Ala Lys
225 230 235 240

Ser Ala Glu Asn Phe Leu Gly Ile Asp Asn Leu Tyr Lys Glu Glu His
245 250 255

Ala Ser Phe Ala Arg His Leu Val Tyr Ala Ile Arg Ala His Lys Leu
260 265 270

Phe Thr Lys Asp Lys Asp Tyr Ile Ile Arg Gly Asn Glu Met Val Leu
275 280 285

Val Asp Lys Gly Thr Gly Arg Leu Met Glu Met Thr Lys Leu Gln Gly
290 295 300

Gly Leu His Gln Ala Ile Glu Ala Lys Glu His Val Lys Leu Ser Pro
305 310 315 320

Glu Thr Arg Ala Met Ala Ser Ile Thr Tyr Gln Ser Leu Phe Lys Met
325 330 335

Phe Asn Lys Ile Ser Gly Met Thr Gly Thr Gly Lys Val Ala Glu Lys
340 345 350

Glu Phe Ile Glu Thr Tyr Asn Met Ser Val Val Arg Ile Pro Thr Asn
355 360 365

Arg Pro Arg Gln Arg Ile Asp Tyr Pro Asp Asn Leu Tyr Ile Thr Leu
370 375 380

Pro Glu Lys Val Tyr Ala Ser Leu Glu Tyr Ile Lys Gln Tyr His Ala
385 390 395 400

Lys Gly Asn Pro Leu Leu Val Phe Val Gly Ser Val Glu Met Ser Gln
405 410 415

Leu Tyr Ser Ser Leu Leu Phe Arg Glu Gly Ile Ala His Asn Val Leu
420 425 430

Asn Ala Asn Asn Ala Ala Arg Glu Ala Gln Ile Ile Ser Glu Ser Gly
435 440 445

Gln Met Gly Ala Val Thr Val Ala Thr Ser Met Ala Gly Arg Gly Thr
450 455 460

Asp Ile Lys Leu Gly Lys Gly Val Ala Glu Leu Gly Gly Leu Ile Val
465 470 475 480

Ile Gly Thr Glu Arg Met Glu Ser Gln Arg Ile Asp Leu Gln Ile Arg
485 490 495

Gly Arg Ser Gly Arg Gln Gly Asp Pro Gly Met Ser Lys Phe Phe Val
500 505 510

Ser Leu Glu Asp Asp Val Ile Lys Lys Phe Gly Pro Ser Trp Val His
515 520 525

Lys Lys Tyr Lys Asp Tyr Gln Val Gln Asp Met Thr Gln Pro Glu Val
530 535 540

Leu Lys Gly Arg Lys Tyr Arg Lys Leu Val Glu Lys Ala Gln His Ala
545 550 555 560

Ser Asp Ser Ala Gly Arg Ser Ala Arg Arg Gln Thr Leu Glu Tyr Ala
565 570 575

Glu Ser Met Asn Ile Gln Arg Asp Ile Val Tyr Lys Glu Arg Asn Arg
580 585 590

Leu Ile Asp Gly Ser Arg Asp Leu Glu Asp Val Val Val Asp Ile Ile
595 600 605

Glu Arg Tyr Thr Glu Glu Val Ala Ala Asp His Tyr Ala Ser Arg Glu
610 615 620

Leu Leu Phe His Phe Ile Val Thr Asn Ile Ser Phe His Val Lys Glu
625 630 635 640

Val Pro Asp Tyr Ile Asp Val Thr Asp Lys Thr Ala Val Arg Ser Phe
645 650 655

Met Lys Gln Val Ile Asp Lys Glu Leu Ser Glu Lys Lys Glu Leu Leu
660 665 670

Asn Gln His Asp Leu Tyr Glu Gln Phe Leu Arg Leu Ser Leu Leu Lys
675 680 685

Ala Ile Asp Asp Asn Trp Val Glu Gln Val Asp Tyr Leu Gln Gln Leu
690 695 700

Ser Met Ala Ile Gly Gly Gln Ser Ala Ser Gln Lys Asn Pro Ile Val
705 710 715 720

Glu Tyr Tyr Gln Glu Ala Tyr Ala Gly Phe Glu Ala Met Lys Glu Gln
725 730 735

Ile His Ala Asp Met Val Arg Asn Leu Leu Met Gly Leu Val Glu Val
740 745 750

Thr Pro Lys Gly Glu Ile Val Thr His Phe Pro

755

760

<210> 111

<211> 879

<212> DNA

<213> Streptococcus pneumoniae

<400> 111

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<210> 112

<211> 292

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<400> 112

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Lys Asn Lys Pro Glu Glu Gln Ala Gln Glu Val Ala Asp Lys Ala Glu
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Glu Arg Ile Pro Asp Leu Asp Thr Pro Ile Glu Lys Asn Thr Gln Leu
35 40 45

Glu Glu Glu Val Ser Gln Ala Glu Val Glu Leu Glu Ser Gln Gln Glu
50 55 60

Glu Lys Ile Glu Ala Pro Glu Asp Ser Glu Ala Arg Thr Glu Ile Glu
65 70 75 80

Glu Lys Lys Ala Ser Asn Ser Thr Glu Glu Glu Pro Asp Leu Ser Lys
85 90 95

Glu Thr Glu Lys Val Thr Ile Ala Glu Glu Ser Gln Glu Ala Leu Pro
100 105 110

Gln Gln Lys Ala Thr Thr Lys Glu Pro Leu Leu Ile Ser Lys Ser Leu
115 120 125

Glu Ser Pro Tyr Ile Pro Asp Gln Ala Pro Lys Ser Arg Asp Lys Trp
130 135 140

Lys Glu Gln Val Leu Asp Phe Trp Ser Trp Leu Val Glu Ala Ile Lys
145 150 155 160

Ser Pro Thr Ser Lys Leu Glu Thr Ser Ile Thr His Ser Tyr Thr Ala
165 170 175

Phe Leu Leu Leu Ile Leu Phe Ser Ala Ser Ser Phe Phe Phe Ser Ile
180 185 190

Tyr His Ile Lys His Ala Tyr Tyr Gly His Ile Ala Ser Ile Asn Ser
195 200 205

Arg Phe Pro Glu Gln Leu Ala Pro Leu Thr Leu Phe Ser Ile Ile Ser
210 215 220

155

Ile Leu Val Ala Thr Thr Leu Phe Phe Phe Ser Phe Leu Leu Gly Ser
225 230 235 240

Phe Val Val Arg Arg Phe Ile His Gln Glu Lys Asp Trp Thr Leu Asp
245 250 255

Lys Val Leu Gln Gln Tyr Ser Gln Leu Leu Ala Ile Pro Ile Ser Ser
260 265 270

Leu Leu Leu Leu Val Ser Leu Leu Ser Leu Ile Ala Tyr Asp Leu Gln
275 280 285

Pro Ser Cys Val

290

<210> 113

<211> 327

<212> DNA

<213> Streptococcus pneumoniae

<400> 113

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gggagtatcc gccatgacaa gaactga 327

<210> 114

<211> 108

<212> PRT

<213> Streptococcus pneumoniae

<400> 114

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Val Leu Glu Gln Gly Asp Ser Tyr Gly Tyr Glu Ile Ser Gln Thr Ile

20

25

30

Lys Leu Ile Ala Asn Ile Lys Glu Ser Thr Leu Tyr Pro Ile Leu Lys

35

40

45

Lys Leu Glu Gly Asn Ser Phe Leu Thr Thr Tyr Ser Arg Glu Phe Gln

50

55

60

Gly Arg Met Arg Lys Tyr Tyr Ser Leu Thr Asn Gly Gly Ile Glu Gln

65

70

75

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Leu Leu Thr Leu Lys Asp Glu Trp Ala Leu Tyr Thr Asp Thr Ile Asn

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Gly Ile Ile Glu Gly Ser Ile Arg His Asp Lys Asn

100

105

<210> 115

<211> 954

<212> DNA

<213> Streptococcus pneumoniae

<400> 115

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<210> 116

<211> 317

<212> PRT

<213> Streptococcus pneumoniae

<400> 116

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Val Gln Val Ile Gln Ser Asp Leu Ala Thr Asn Phe Tyr Asp Ala Leu

20	25	30
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Val Glu Gln Asn Ser Ile Tyr Leu Asp Gly Glu Thr Glu Leu Asn Gln

35	40	45
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Val Lys Asp Asn Asn Gln Ala Leu Lys Arg Leu Ala Leu Arg Lys Glu

50	55	60
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Glu Trp Leu Lys Thr Tyr Gln Phe Leu Leu Met Lys Ala Gly Gln Thr

65	70	75	80
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Glu Pro Leu Gln Ala Asn His Gln Phe Thr Pro Asp Ala Ile Ala Leu

85	90	95
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Leu Leu Val Phe Ile Val Glu Glu Leu Phe Lys Glu Glu Ile Thr

100	105	110
-----	-----	-----

Ile Leu Glu Met Gly Ser Gly Met Gly Ile Leu Gly Ala Ile Phe Leu

115	120	125
-----	-----	-----

Thr Ser Leu Thr Lys Lys Val Asp Tyr Leu Gly Met Glu Val Asp Asp

130	135	140
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Leu Leu Ile Asp Leu Ala Ala Ser Met Ala Asp Val Ile Gly Leu Gln
145 150 155 160

Ala Gly Phe Val Gln Gly Asp Ala Val Arg Pro Gln Met Leu Lys Glu
165 170 175

Ser Asp Val Val Ile Ser Asp Leu Pro Val Gly Tyr Tyr Pro Asp Asp
180 185 190

Ala Val Ala Ser Arg His Gln Val Ala Ser Ser Gln Glu His Thr Tyr
195 200 205

Ala His His Leu Leu Met Glu Gln Gly Leu Lys Tyr Leu Lys Ser Asp
210 215 220

Gly Tyr Ala Ile Phe Leu Ala Pro Ser Asp Leu Leu Thr Ser Pro Gln
225 230 235 240

Ser Asp Leu Leu Lys Glu Trp Leu Lys Glu Glu Ala Ser Leu Val Ala
245 250 255

Met Ile Ser Leu Pro Glu Asn Leu Phe Ala Asn Ala Lys Gln Ser Lys
260 265 270

Thr Ile Phe Ile Leu Gln Lys Lys Asn Glu Ile Ala Val Glu Pro Phe
275 280 285

Val Tyr Pro Leu Ala Ser Leu Gln Asp Ala Ser Val Leu Met Lys Phe
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Lys Glu Asn Phe Gln Lys Trp Thr Gln Gly Thr Glu Ile
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<210> 117

<211> 1902

<212> DNA

<213> Streptococcus pneumoniae

<400> 117

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<210> 118

<211> 633

<212> PRT

<213> Streptococcus pneumoniae

<400> 118

Met Ile Ile Leu Gln Ala Asn Lys Ile Glu Arg Ser Phe Ala Gly Glu

1

5

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15

Val Leu Phe Asp Asn Ile Asn Leu Gln Val Asp Glu Arg Asp Arg Ile

20

25

30

Ala Leu Val Gly Lys Asn Gly Ala Gly Lys Ser Thr Leu Leu Lys Ile

35

40

45

Leu Val Gly Glu Glu Pro Thr Ser Gly Glu Ile Asn Lys Lys Lys

50

55

60

Asp Ile Ser Leu Ser Tyr Leu Ala Gln Asp Ser Arg Phe Glu Ser Glu

65

70

75

80

Asn Thr Ile Tyr Asp Glu Met Leu His Val Phe Asn Asp Leu Arg Arg

85

90

95

Thr Glu Arg Gln Leu Arg Gln Met Glu Leu Glu Met Gly Glu Lys Ser

100

105

110

Gly Glu Asp Leu Asp Lys Leu Met Ser Asp Tyr Asp Arg Leu Ser Glu

115

120

125

Asn Phe Arg Gln Ala Gly Phe Thr Tyr Glu Ala Asp Ile Arg Ala

130

135

140

Ile Leu Asn Gly Phe Lys Phe Asp Glu Ser Met Trp Gln Met Lys Ile

145

150

155

160

Ala Glu Leu Ser Gly Gly Gln Asn Thr Arg Leu Ala Leu Ala Lys Met
165 170 175

Leu Leu Glu Lys Pro Asn Leu Leu Val Leu Asp Glu Pro Thr Asn His
180 185 190

Leu Asp Ile Glu Thr Ile Ala Trp Leu Glu Asn Tyr Leu Val Asn Tyr
195 200 205

Ser Gly Ala Leu Ile Ile Val Ser His Asp Arg Tyr Phe Leu Asp Lys
210 215 220

Val Ala Thr Ile Thr Leu Asp Leu Thr Lys His Ser Leu Asp Arg Tyr
225 230 235 240

Val Gly Asn Tyr Ser Arg Phe Val Glu Leu Lys Glu Gln Lys Leu Val
245 250 255

Thr Glu Ala Lys Asn Tyr Glu Lys Gln Gln Lys Glu Ile Ala Ala Leu
260 265 270

Glu Asp Phe Val Asn Arg Asn Leu Val Arg Ala Ser Thr Thr Lys Arg
275 280 285

Ala Gln Ser Arg Arg Lys Gln Leu Glu Lys Met Glu Arg Leu Asp Lys
290 295 300

Pro Glu Ala Gly Lys Lys Ala Ala Asn Met Thr Phe Gln Ser Glu Lys
305 310 315 320

Thr Ser Gly Asn Val Val Leu Thr Val Glu Asn Ala Ala Val Gly Tyr
325 330 335

Asp Gly Glu Val Leu Ser Gln Pro Ile Asn Leu Asp Leu Arg Lys Met
340 345 350

Asn Ala Val Ala Ile Val Gly Pro Asn Gly Ile Gly Lys Ser Thr Phe
355 360 365

Ile Lys Ser Ile Val Asp Gln Ile Pro Phe Ile Lys Gly Glu Lys Arg
370 375 380

Phe Gly Ala Asn Val Glu Val Gly Tyr Tyr Asp Gln Thr Gln Ser Lys
385 390 395 400

Leu Thr Pro Ser Asn Thr Val Leu Asp Glu Leu Trp Asn Asp Phe Lys
405 410 415

Leu Thr Pro Glu Val Glu Ile Arg Asn Arg Leu Gly Ala Phe Leu Phe
420 425 430

Ser Gly Asp Asp Val Lys Lys Ser Val Gly Met Leu Ser Gly Gly Glu
435 440 445

Lys Ala Arg Leu Leu Leu Ala Lys Leu Ser Met Glu Asn Asn Asn Phe
450 455 460

Leu Ile Leu Asp Glu Pro Thr Asn His Leu Asp Ile Asp Ser Lys Glu
465 470 475 480

Val Leu Glu Asn Ala Leu Ile Asp Phe Asp Gly Thr Leu Leu Phe Val
485 490 495

Ser His Asp Arg Tyr Phe Ile Asn Arg Val Ala Thr His Val Leu Glu
500 505 510

Leu Ser Glu Asn Gly Ser Thr Leu Tyr Leu Gly Asp Tyr Asp Tyr Tyr
515 520 525

Val Glu Lys Lys Ala Thr Ala Glu Met Ser Gln Thr Glu Glu Ala Ser
530 535 540

Thr Ser Asn Gln Ala Lys Glu Ala Ser Pro Val Asn Asp Tyr Gln Ala
545 550 555 560

Gln Lys Glu Ser Gln Lys Glu Val Arg Lys Leu Met Arg Gln Ile Glu
565 570 575

Ser Leu Glu Ala Glu Ile Glu Glu Leu Glu Ser Gln Ser Gln Ala Ile
580 585 590

Ser Glu Gln Met Leu Glu Thr Asn Asp Ala Asp Lys Leu Met Glu Leu
595 600 605

Gln Ala Glu Leu Asp Lys Ile Ser His Arg Gln Glu Glu Ala Met Leu
610 615 620

Glu Trp Glu Glu Leu Ser Glu Gln Val
625 630

<210> 119

<211> 1179

<212> DNA

<213> Streptococcus pneumoniae

<400> 119

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ctcgatatg ttcaactca ttttgaaaaa ttgatataa 1179

<210> 120

<211> 392

<212> PRT

<213> Streptococcus pneumoniae

<400> 120

Met Asn Arg Tyr Ala Val Gln Leu Ile Ser Arg Gly Ala Ile Asn Lys

1

5

10

15

Met Gly Asn Met Leu Tyr Asp Tyr Gly Asn Ser Val Trp Leu Ala Ser

20

25

30

Met Gly Thr Ile Gly Gln Thr Val Leu Gly Met Tyr Gln Ile Ser Glu

35

40

45

Leu Val Thr Ser Ile Leu Val Asn Pro Phe Gly Gly Val Ile Ser Asp

50

55

60

Arg Phe Ser Arg Arg Lys Ile Leu Met Thr Ala Asp Leu Val Cys Gly

65

70

75

80

Ile Leu Cys Leu Ala Ile Ser Phe Ile Arg Asn Asp Ser Trp Met Ile

85

90

95

Gly Ala Leu Ile Val Ala Asn Ile Val Gln Ala Ile Ala Phe Ala Phe

100

105

110

Ser Arg Thr Ala Asn Lys Ala Ile Ile Thr Glu Val Val Glu Lys Asp

115

120

125

Glu Ile Val Ile Tyr Asn Ser Arg Leu Glu Leu Val Leu Gln Val Val

130

135

140

165

Gly Val Ser Ser Pro Val Leu Ser Phe Leu Val Leu Gln Phe Ala Ser
145 150 155 160

Leu His Met Thr Leu Leu Leu Asp Ser Leu Thr Phe Phe Ile Ala Phe
165 170 175

Val Leu Val Ala Phe Leu Pro Lys Glu Glu Ala Lys Val Gln Glu Lys
180 185 190

Lys Ala Phe Thr Gly Arg Asp Ile Phe Val Asp Ile Lys Asp Gly Leu
195 200 205

His Tyr Ile Trp His Gln Gln Glu Ile Phe Phe Leu Leu Leu Val Ala
210 215 220

Ser Ser Val Asn Phe Phe Phe Ala Ala Phe Glu Phe Leu Leu Pro Phe
225 230 235 240

Ser Asn Gln Leu Tyr Gly Ser Glu Gly Ala Tyr Ala Ser Ile Leu Thr
245 250 255

Met Gly Ala Ile Gly Ser Ile Ile Gly Ala Leu Leu Ala Ser Lys Ile
260 265 270

Lys Ala Asn Ile Tyr Asn Leu Leu Ile Leu Leu Ala Leu Thr Gly Val
275 280 285

Gly Val Phe Met Met Gly Leu Pro Leu Pro Thr Phe Leu Ser Phe Ser
290 295 300

Gly Asn Leu Val Cys Glu Leu Phe Met Thr Ile Phe Asn Ile His Phe
305 310 315 320

Phe Thr Gln Val Gln Thr Lys Val Glu Ser Glu Phe Leu Gly Arg Val
325 330 335

Leu Ser Thr Ile Phe Thr Leu Ala Ile Leu Phe Met Pro Ile Ala Lys
340 345 350

Gly Phe Met Thr Val Leu Pro Ser Val His Leu Tyr Ser Phe Leu Ile

355

360

365

Ile Gly Leu Gly Val Val Ala Leu Tyr Phe Leu Ala Leu Gly Tyr Val

370

375

380

Arg Thr His Phe Glu Lys Leu Ile

385

390

<210> 121

<211> 2466

<212> DNA

<213> Streptococcus pneumoniae

<400> 121

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 ttagataagt cagccatttt cccagctatt ttactgagta taaaagcctt atttaactta 180
 ctctttgtac tcgggtttct aggaggaatg ttgggagctg ggattgctt gggatacgga 240
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 cgataa 2466

<210> 122

<211> 821

<212> PRT

<213> Streptococcus pneumoniae

<400> 122

Met Gln Asn Gln Leu Asn Glu Leu Lys Arg Lys Met Leu Glu Phe Phe

1

5

10

15

Gln Gln Lys Gln Lys Asn Lys Ser Ala Arg Pro Gly Lys Lys Gly

20

25

30

Ser Ser Thr Lys Lys Ser Lys Thr Leu Asp Lys Ser Ala Ile Phe Pro

35

40

45

Ala Ile Leu Leu Ser Ile Lys Ala Leu Phe Asn Leu Leu Phe Val Leu
50 55 60

Gly Phe Leu Gly Gly Met Leu Gly Ala Gly Ile Ala Leu Gly Tyr Gly
65 70 75 80

Val Ala Leu Phe Asp Lys Val Arg Val Pro Gln Thr Glu Glu Leu Val
85 90 95

Asn Gln Val Lys Asp Ile Ser Ser Ile Ser Glu Ile Thr Tyr Ser Asp
100 105 110

Gly Thr Val Ile Ala Ser Ile Glu Ser Asp Leu Leu Arg Thr Ser Ile
115 120 125

Ser Ser Glu Gln Ile Ser Glu Asn Leu Lys Lys Ala Ile Ile Ala Thr
130 135 140

Glu Asp Glu His Phe Lys Glu His Lys Gly Val Val Pro Lys Ala Val
145 150 155 160

Ile Arg Ala Thr Leu Gly Lys Phe Val Gly Leu Gly Ser Ser Ser Gly
165 170 175

Gly Ser Thr Leu Thr Gln Gln Leu Ile Lys Gln Gln Val Val Gly Asp
180 185 190

Ala Pro Thr Leu Ala Arg Lys Ala Ala Glu Ile Val Asp Ala Leu Ala
195 200 205

Leu Glu Arg Ala Met Asn Lys Asp Glu Ile Leu Thr Thr Tyr Leu Asn
210 215 220

Val Ala Pro Phe Gly Arg Asn Asn Lys Gly Gln Asn Ile Ala Gly Ala
225 230 235 240

Arg Gln Ala Ala Glu Gly Ile Phe Gly Val Asp Ala Ser Gln Leu Thr
245 250 255

Val Pro Gln Ala Ala Phe Leu Ala Gly Leu Pro Gln Ser Pro Ile Thr
260 265 270

Tyr Ser Pro Tyr Glu Asn Thr Gly Glu Leu Lys Ser Asp Glu Asp Leu
275 280 285

Glu Ile Gly Leu Arg Arg Ala Lys Ala Val Leu Tyr Ser Met Tyr Arg
290 295 300

Thr Gly Ala Leu Ser Lys Asp Glu Tyr Ser Gln Tyr Lys Asp Tyr Asp
305 310 315 320

Leu Lys Gln Asp Phe Leu Pro Ser Gly Thr Val Thr Gly Ile Ser Arg
325 330 335

Asp Tyr Leu Tyr Phe Thr Thr Leu Ala Glu Ala Gln Glu Arg Met Tyr
340 345 350

Asp Tyr Leu Ala Gln Arg Asp Asn Val Ser Ala Lys Glu Leu Lys Asn
355 360 365

Glu Ala Thr Gln Lys Phe Tyr Arg Asp Leu Ala Ala Lys Glu Ile Glu
370 375 380

Asn Gly Gly Tyr Lys Ile Thr Thr Ile Asp Gln Lys Ile His Ser
385 390 395 400

Ala Met Gln Ser Ala Val Ala Asp Tyr Gly Tyr Leu Leu Asp Asp Gly
405 410 415

Thr Gly Arg Val Glu Val Gly Asn Val Leu Met Asp Asn Gln Thr Gly
420 425 430

Ala Ile Leu Gly Phe Val Gly Arg Asn Tyr Gln Glu Asn Gln Asn
435 440 445

Asn His Ala Phe Asp Thr Lys Arg Ser Pro Ala Ser Thr Thr Lys Pro
450 455 460

170

Leu Leu Ala Tyr Gly Ile Ala Ile Asp Gln Gly Leu Met Gly Ser Glu
465 470 475 480

Thr Ile Leu Ser Asn Tyr Pro Thr Asn Phe Ala Asn Gly Asn Pro Ile
485 490 495

Met Tyr Ala Asn Ser Lys Gly Thr Gly Met Met Thr Leu Gly Glu Ala
500 505 510

Leu Asn Tyr Ser Trp Asn Ile Pro Ala Tyr Trp Thr Tyr Arg Met Leu
515 520 525

Arg Glu Lys Gly Val Asp Val Lys Gly Tyr Met Glu Lys Met Gly Tyr
530 535 540

Glu Ile Pro Glu Tyr Gly Ile Glu Ser Leu Pro Met Gly Gly Ile
545 550 555 560

Glu Val Thr Val Ala Gln His Thr Asn Gly Tyr Gln Thr Leu Ala Asn
565 570 575

Asn Gly Val Tyr His Gln Lys His Val Ile Ser Lys Ile Glu Ala Ala
580 585 590

Asp Gly Arg Val Val Tyr Glu Tyr Gln Asp Lys Pro Val Gln Val Tyr
595 600 605

Ser Lys Ala Thr Ala Thr Ile Met Gln Gly Leu Leu Arg Glu Val Leu
610 615 620

Ser Ser Arg Val Thr Thr Phe Lys Ser Asn Leu Thr Ser Leu Asn
625 630 635 640

Pro Thr Leu Ala Asn Ala Asp Trp Ile Gly Lys Thr Gly Thr Thr Asn
645 650 655

Gln Asp Glu Asn Met Trp Leu Met Leu Ser Thr Pro Arg Leu Thr Leu
660 665 670

Gly Gly Trp Ile Gly His Asp Asp Asn His Ser Leu Ser Arg Arg Ala
675 680 685

Gly Tyr Ser Asn Asn Ser Asn Tyr Met Ala His Leu Val Asn Ala Ile
690 695 700

Gln Gln Ala Ser Pro Ser Ile Trp Gly Asn Glu Arg Phe Ala Leu Asp
705 710 715 720

Pro Ser Val Val Lys Ser Glu Val Leu Lys Ser Thr Gly Gln Lys Pro
725 730 735

Glu Lys Val Ser Val Glu Gly Lys Glu Val Glu Val Thr Gly Ser Thr
740 745 750

Val Thr Ser Tyr Trp Ala Asn Lys Ser Gly Ala Pro Ala Thr Ser Tyr
755 760 765

Arg Phe Ala Ile Gly Gly Ser Asp Ala Asp Tyr Gln Asn Ala Trp Ser
770 775 780

Ser Ile Val Gly Ser Leu Pro Thr Pro Ser Ser Ser Ser Ser Ser
785 790 795 800

Ser Ser Ser Ser Asp Ser Ser Asn Ser Ser Thr Thr Arg Pro Ser Ser
805 810 815

Ser Arg Ala Arg Arg
820

<210> 123

<211> 1974

<212> DNA

<213> Streptococcus pneumoniae

<400> 123

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aaactgacag aaattgtattt aaatgaaatg aaggaaaagg agaaagaaga atga 1974

<210> 124

<211> 657

<212> PRT

<213> Streptococcus pneumoniae

<400> 124

Met Lys Lys Phe Tyr Val Ser Pro Ile Phe Pro Ile Leu Val Gly Leu
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20 25 30

Leu Leu Thr Val Leu Ile Leu Phe Leu Phe Val Gly Gly Tyr Val Phe
35 40 45

Leu Phe Lys Lys Leu Arg Val His Tyr Thr Arg Ser Asp Val Glu Gln
50 55 60

Ile Gln Tyr Val Asn His Gln Ala Glu Glu Ser Leu Thr Ala Leu Leu
65 70 75 80

Glu Gln Met Pro Val Gly Val Met Lys Leu Asn Leu Ser Ser Gly Glu
85 90 95

Val Glu Trp Phe Asn Pro Tyr Ala Glu Leu Ile Leu Thr Lys Glu Asp
100 105 110

Gly Asp Phe Asp Leu Glu Ala Val Gln Thr Ile Ile Lys Ala Ser Val
115 120 125

Gly Asn Pro Ser Thr Tyr Ala Lys Leu Gly Glu Lys Arg Tyr Ala Val
130 135 140

His Met Asp Ala Ser Ser Gly Val Leu Tyr Phe Val Asp Val Ser Arg
145 150 155 160

Glu Gln Ala Ile Thr Asp Glu Leu Val Thr Ser Arg Pro Val Ile Gly
165 170 175

Ile Val Ser Val Asp Asn Tyr Asp Asp Leu Glu Asp Glu Thr Ser Glu
180 185 190

Ser Asp Ile Ser Gln Ile Asn Ser Phe Val Ala Asn Phe Ile Ser Glu
195 200 205

Phe Ser Glu Lys His Met Met Phe Ser Arg Arg Val Ser Met Asp Arg
210 215 220

Phe Tyr Leu Phe Thr Asp Tyr Thr Val Leu Glu Gly Leu Met Asn Asp
225 230 235 240

Lys Phe Ser Val Ile Asp Ala Phe Arg Glu Glu Ser Lys Gln Arg Gln
245 250 255

Leu Pro Leu Thr Leu Ser Met Gly Phe Ser Tyr Gly Asp Gly Asn His
260 265 270

Asp Glu Ile Gly Lys Val Ala Leu Leu Asn Leu Asn Leu Ala Glu Val
275 280 285

Arg Gly Gly Asp Gln Val Val Val Lys Glu Asn Asp Glu Thr Lys Asn
290 295 300

Pro Val Tyr Phe Gly Gly Ser Ala Ala Ser Ile Lys Arg Thr Arg
305 310 315 320

Thr Arg Thr Arg Ala Met Met Thr Ala Ile Ser Asp Lys Ile Arg Ser
325 330 335

Val Asp Gln Val Phe Val Val Gly His Lys Asn Leu Asp Met Asp Ala
340 345 350

Leu Gly Ser Ala Val Gly Met Gln Leu Phe Ala Ser Asn Val Ile Glu
355 360 365

Asn Ser Tyr Ala Leu Tyr Asp Glu Glu Gln Met Ser Pro Asp Ile Glu
370 375 380

Arg Ala Val Ser Phe Ile Glu Lys Glu Gly Val Thr Lys Leu Leu Ser
385 390 395 400

Val Lys Asp Ala Met Gly Met Val Thr Asn Arg Ser Leu Leu Ile Leu
405 410 415

Val Asp His Ser Lys Thr Ala Leu Thr Leu Ser Lys Glu Phe Tyr Asp
420 425 430

Leu Phe Thr Gln Thr Ile Val Ile Asp His His Arg Arg Asp Gln Asp
435 440 445

Phe Pro Asp Asn Ala Val Ile Thr Tyr Ile Glu Ser Gly Ala Ser Ser
450 455 460

Ala Ser Glu Leu Val Thr Glu Leu Ile Gln Phe Gln Asn Ser Lys Lys
465 470 475 480

Asn Arg Leu Ser Arg Met Gln Ala Ser Val Leu Met Ala Gly Met Met
485 490 495

Leu Asp Thr Lys Asn Phe Thr Ser Arg Val Thr Ser Arg Thr Phe Asp
500 505 510

Val Ala Ser Tyr Leu Arg Thr Arg Gly Ser Asp Ser Ile Ala Ile Gln
515 520 525

Glu Ile Ala Ala Thr Asp Phe Glu Glu Tyr Arg Glu Val Asn Glu Leu
530 535 540

Ile Leu Gln Gly Arg Lys Leu Gly Ser Asp Val Leu Ile Ala Glu Ala
545 550 555 560

Lys Asp Met Lys Cys Tyr Asp Thr Val Val Ile Ser Lys Ala Ala Asp
565 570 575

Ala Met Leu Ala Met Ser Gly Ile Glu Ala Ser Phe Val Leu Ala Lys
580 585 590

Asn Thr Gln Gly Phe Ile Ser Ile Ser Ala Arg Ser Arg Ser Lys Leu
595 600 605

Asn Val Gln Arg Ile Met Glu Glu Leu Gly Gly Gly His Phe Asn
 610 615 620

Leu Ala Ala Ala Gln Ile Lys Asp Val Thr Leu Ser Glu Ala Gly Glu
 625 630 635 640

Lys Leu Thr Glu Ile Val Leu Asn Glu Met Lys Glu Lys Glu Lys Glu
 645 650 655

Glu

<210> 125

<211> 663

<212> DNA

<213> Streptococcus pneumoniae

<400> 125

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 gggaaagaga actgtccaaa ttgtatgaaa acagagttgt caacaaagtg tcaagattgt 180
 caacttttgtt gtaaagaggg agttgaagtc agtcatagag cgattttac ttacaatcaa 240
 gctatgaagg attttttcag tcggataaag tttgatggag acttcctgtt aagaaaagtt 300
 ttcgcttcatttttaagtga ggagttgaaa aagtacaaag agtatcaatt tggtgtaatt 360
 cccctaagtc ctgatagata tgctaataga ggatttaatc aggttgaggg cttggtagag 420
 gcagcaggct ttgagtatct ggattttatta gagaaaaagag aagagagagc cagttttct 480
 aaaaatcggtt cagagcgctt gggcacagaa cttcccttct ttattaaaag tggagtcaact 540
 attcctaaaa aaatccctact tatagatgat atctatacta caggagcaac tataaatcg 600
 gttaagaaac tggatgtggct aaggatgtaa aaacattttc ctttgtaaga 660
 tga 663

<210> 126

<211> 220

<212> PRT

<213> Streptococcus pneumoniae

<400> 126

Met Lys Cys Leu Leu Cys Gly Gln Thr Met Lys Thr Val Leu Thr Phe			
1	5	10	15

Ser Ser Leu Leu Leu Leu Arg Asn Asp Asp Ser Cys Leu Cys Ser Asp			
20	25	30	

Cys Asp Ser Thr Phe Glu Arg Ile Gly Glu Glu Asn Cys Pro Asn Cys			
35	40	45	

Met Lys Thr Glu Leu Ser Thr Lys Cys Gln Asp Cys Gln Leu Trp Cys			
50	55	60	

Lys Glu Gly Val Glu Val Ser His Arg Ala Ile Phe Thr Tyr Asn Gln			
65	70	75	80

Ala Met Lys Asp Phe Phe Ser Arg Tyr Lys Phe Asp Gly Asp Phe Leu			
85	90	95	

Leu Arg Lys Val Phe Ala Ser Phe Leu Ser Glu Glu Leu Lys Lys Tyr			
100	105	110	

Lys Glu Tyr Gln Phe Val Val Ile Pro Leu Ser Pro Asp Arg Tyr Ala			
115	120	125	

Asn Arg Gly Phe Asn Gln Val Glu Gly Leu Val Glu Ala Ala Gly Phe			
130	135	140	

Glu Tyr Leu Asp Leu Leu Glu Lys Arg Glu Glu Arg Ala Ser Ser Ser			
145	150	155	160

Lys Asn Arg Ser Glu Arg Leu Gly Thr Glu Leu Pro Phe Phe Ile Lys			
165	170	175	

Ser Gly Val Thr Ile Pro Lys Lys Ile Leu Leu Ile Asp Asp Ile Tyr			
180	185	190	

Thr Thr Gly Ala Thr Ile Asn Arg Val Lys Lys Leu Leu Glu Glu Ala
 195 200 205

Gly Ala Lys Asp Val Lys Thr Phe Ser Leu Val Arg
 210 215 220

<210> 127
<211> 1299
<212> DNA
<213> Streptococcus pneumoniae

<400> 127
atgaaaagtaa attagatta tctcggtcgt ttatttactg agaatgaatt aacagaagaa 60
gaacgtcagt tggcgagaa acttccagca atgagaaagg agaaggggaa acttttcgt 120
caacgcgtta atagtactat tctagaagaa tggtatttgc ccatcggtgc ttactattgt 180
cgagagtgcgt tgctgatgaa gcgagtcaga agtgatcaaa cttaatacta ttttccgcag 240
gaggattttc caaagcaaga tggctcaaaa tggcgccgc aattaactcc ttttcaagag 300
aagggtgcag agggattgct tcaagtagta gacaagcaaa agccaacctt agttcatgcg 360
gtAACAGGAG ctggaaagac agaaatgatt tatcaagtag tggctaaagt gatcaatgcg 420
ggTGGTGCAG tgtgtttggc tagtcctcgc atagatgtt gttggagct gtacaagcgc 480
ctgcaacagg atttttcttgc cggatagct ttgctacatg gagaatcgga accttatttt 540
cgaacaccac tagttgttgc aacaacccat cagttattga agtttatca agctttgat 600
ttgctgatag tggatgaagt agatgtttt ctttatgtt ataatccat gcttaccac 660
gctgtcaaga atagttaaaa ggagaatgga ttgagaatct ttttaacagc gacttcgacc 720
aatgagttag ataaaaaggc ccgttttagga gaactaaaaa gactgaattt accgagacgg 780
tttcatggaa atccgttgat tattccaaaa ccaatttggt tatcgattt taatcgctac 840
ttagacaaga atcggttgc accaaagtta aagtcctata ttgagaagca gagaaagaca 900
gcttatccgt tactcatttt tgcttcagaa attaagaaag gggagcagtt agcagaaaatc 960
ttacaggagc aatttccaaa tgagaaaatt ggcttgcgtat cttctgttaac agaggatcga 1020
tttagagcaag tacaagcttt tcgagatgga gaactgacaa tacttacatc tacggacaatc 1080
ttggagcgcgc gagttacattt cccttgcgtg gatgtttcg tagtagaggc caatcatcgt 1140
ttgtttacca agtctagttt gattcagatt ggtggacgag ttggacgaag catggataga 1200
ccgacaggag atttgtttt cttccatgtat gggtaaatg cttcaatcaa gaaggcgatt 1260
aaggaaattc agatgatgaa taaggaggt ggtctatga 1299

<210> 128

<211> 432

<212> PRT

<213> Streptococcus pneumoniae

<400> 128

Met Lys Val Asn Leu Asp Tyr Leu Gly Arg Leu Phe Thr Glu Asn Glu

1

5

10

15

Leu Thr Glu Glu Glu Arg Gln Leu Ala Glu Lys Leu Pro Ala Met Arg

20

25

30

Lys Glu Lys Gly Lys Leu Phe Cys Gln Arg Cys Asn Ser Thr Ile Leu

35

40

45

Glu Glu Trp Tyr Leu Pro Ile Gly Ala Tyr Tyr Cys Arg Glu Cys Leu

50

55

60

Leu Met Lys Arg Val Arg Ser Asp Gln Thr Leu Tyr Tyr Phe Pro Gln

65

70

75

80

Glu Asp Phe Pro Lys Gln Asp Val Leu Lys Trp Arg Gly Gln Leu Thr

85

90

95

Pro Phe Gln Glu Lys Val Ser Glu Gly Leu Leu Gln Val Val Asp Lys

100

105

110

Gln Lys Pro Thr Leu Val His Ala Val Thr Gly Ala Gly Lys Thr Glu

115

120

125

Met Ile Tyr Gln Val Val Ala Lys Val Ile Asn Ala Gly Gly Ala Val

130

135

140

Cys Leu Ala Ser Pro Arg Ile Asp Val Cys Leu Glu Leu Tyr Lys Arg

145

150

155

160

Leu Gln Gln Asp Phe Ser Cys Gly Ile Ala Leu Leu His Gly Glu Ser

165

170

175

180

Glu Pro Tyr Phe Arg Thr Pro Leu Val Val Ala Thr Thr His Gln Leu
180 185 190

Leu Lys Phe Tyr Gln Ala Phe Asp Leu Leu Ile Val Asp Glu Val Asp
195 200 205

Ala Phe Pro Tyr Val Asp Asn Pro Met Leu Tyr His Ala Val Lys Asn
210 215 220

Ser Val Lys Glu Asn Gly Leu Arg Ile Phe Leu Thr Ala Thr Ser Thr
225 230 235 240

Asn Glu Leu Asp Lys Lys Val Arg Leu Gly Glu Leu Lys Arg Leu Asn
245 250 255

Leu Pro Arg Arg Phe His Gly Asn Pro Leu Ile Ile Pro Lys Pro Ile
260 265 270

Trp Leu Ser Asp Phe Asn Arg Tyr Leu Asp Lys Asn Arg Leu Ser Pro
275 280 285

Lys Leu Lys Ser Tyr Ile Glu Lys Gln Arg Lys Thr Ala Tyr Pro Leu
290 295 300

Leu Ile Phe Ala Ser Glu Ile Lys Lys Gly Glu Gln Leu Ala Glu Ile
305 310 315 320

Leu Gln Glu Gln Phe Pro Asn Glu Lys Ile Gly Phe Val Ser Ser Val
325 330 335

Thr Glu Asp Arg Leu Glu Gln Val Gln Ala Phe Arg Asp Gly Glu Leu
340 345 350

Thr Ile Leu Ile Ser Thr Thr Ile Leu Glu Arg Gly Val Thr Phe Pro
355 360 365

Cys Val Asp Val Phe Val Val Glu Ala Asn His Arg Leu Phe Thr Lys
370 375 380

Ser Ser Leu Ile Gln Ile Gly Gly Arg Val Gly Arg Ser Met Asp Arg
385 390 395 400

Pro Thr Gly Asp Leu Leu Phe Phe His Asp Gly Leu Asn Ala Ser Ile
405 410 415

Lys Lys Ala Ile Lys Glu Ile Gln Met Met Asn Lys Glu Ala Gly Leu
420 425 430

<210> 129

<211> 870

<212> DNA

<213> Streptococcus pneumoniae

<400> 129

atgcaaattc aaaaaagttt taaggggcag tctccctatg gcaagctgta tctagtggca 60
acgccgattg gcaatctaga tgatatgact tttcgctgcta tccagacctt gaaagaagtg 120
gactggattg ctgctgagga tacgcgcaat acaggcgttt tgctcaagca ttttgacatt 180
tccaccaagc agatcagttt tcatgagcac aatgccaagg aaaaaattcc tgatttgatt 240
ggtttcttga aagcagggca aagtattgct caggtctctg atgcccgttt gcctagcatt 300
tcagaccctg gtcatgattt agttaaggca gctattgagg aagaaaattgc agtttgtaca 360
gttccaggtg cctctgcagg aatttctgcc ttgattgcca gtggtttagc gccacagcca 420
catatctttt acggttttt accgagaaaa tcaggtcagc agaagcaatt ttttggcttg 480
aaaaaaagatt atcctgaaac acagattttt tatgaatcac ctcatcgtgt agcagacacg 540
ttggaaaata tgttagaagt ctacggtgac cgctccgttg tcttggtcag ggaattgacc 600
aaaatctatg aagaataccca acgaggtaact atctctgagt tattagaaaag cattgctgaa 660
acgccactca agggcgaatg tcttctcatt gttgagggtg ccagtcaggg tgtggaggaa 720
aaggacgagg aagacttgtt cgtagaaaatt caaacccgca tccagcaagg tgtgaagaaa 780
aaccaagcta tcaaggaagt cgctaagatt taccagtgga ataaaaagtca gctctacgct 840
gcctaccacg actgggaaga aaaacaataa 870

<210> 130

<211> 289

<212> PRT

<213> Streptococcus pneumoniae

<400> 130

Met Gln Ile Gln Lys Ser Phe Lys Gly Gln Ser Pro Tyr Gly Lys Leu
1 5 10 15

Tyr Leu Val Ala Thr Pro Ile Gly Asn Leu Asp Asp Met Thr Phe Arg
20 25 30

Ala Ile Gln Thr Leu Lys Glu Val Asp Trp Ile Ala Ala Glu Asp Thr
35 40 45

Arg Asn Thr Gly Leu Leu Leu Lys His Phe Asp Ile Ser Thr Lys Gln
50 55 60

Ile Ser Phe His Glu His Asn Ala Lys Glu Lys Ile Pro Asp Leu Ile
65 70 75 80

Gly Phe Leu Lys Ala Gly Gln Ser Ile Ala Gln Val Ser Asp Ala Gly
85 90 95

Leu Pro Ser Ile Ser Asp Pro Gly His Asp Leu Val Lys Ala Ala Ile
100 105 110

Glu Glu Glu Ile Ala Val Val Thr Val Pro Gly Ala Ser Ala Gly Ile
115 120 125

Ser Ala Leu Ile Ala Ser Gly Leu Ala Pro Gln Pro His Ile Phe Tyr
130 135 140

Gly Phe Leu Pro Arg Lys Ser Gly Gln Gln Lys Gln Phe Phe Gly Leu
145 150 155 160

Lys Lys Asp Tyr Pro Glu Thr Gln Ile Phe Tyr Glu Ser Pro His Arg
165 170 175

Val Ala Asp Thr Leu Glu Asn Met Leu Glu Val Tyr Gly Asp Arg Ser
 180 185 190

Val Val Leu Val Arg Glu Leu Thr Lys Ile Tyr Glu Glu Tyr Gln Arg
 195 200 205

Gly Thr Ile Ser Glu Leu Leu Glu Ser Ile Ala Glu Thr Pro Leu Lys
 210 215 220

Gly Glu Cys Leu Leu Ile Val Glu Gly Ala Ser Gln Gly Val Glu Glu
 225 230 235 240

Lys Asp Glu Glu Asp Leu Phe Val Glu Ile Gln Thr Arg Ile Gln Gln
 245 250 255

Gly Val Lys Lys Asn Gln Ala Ile Lys Glu Val Ala Lys Ile Tyr Gln
 260 265 270

Trp Asn Lys Ser Gln Leu Tyr Ala Ala Tyr His Asp Trp Glu Glu Lys
 275 280 285

Gln

<210> 131

<211> 345

<212> DNA

<213> Streptococcus pneumoniae

<400> 131

atgataaaaga aaggaaaagg ctgttttatg gacaaaaaaag aattatttga cgcgcgtggat 60
 gattttccc aacaattatt ggtaacctta gccgatgtgg aagccatcaa gaaaaatctc 120
 aagagcctgg tagaggaaaa tacagcttt cgcttgaaaa atagtaagtt gcgagaacgc 180
 ttgggtgagg tggaaaggaga tgctcctgtc aaggccaaggc atgttcgaga aagtgtccgt 240
 cgtatttacc gtgtatggatt tcacgtatgt aatgatttt atggacaacg tcgagagcag 300
 gacgaagaat gtatgttttg tgacgagttg ttatacaggg agtaa 345

<210> 132

<211> 114

<212> PRT

<213> Streptococcus pneumoniae

<400> 132

Met Ile Lys Lys Gly Lys Gly Cys Phe Met Asp Lys Lys Glu Leu Phe
1 5 10 15

Asp Ala Leu Asp Asp Phe Ser Gln Gln Leu Leu Val Thr Leu Ala Asp
20 25 30

Val Glu Ala Ile Lys Lys Asn Leu Lys Ser Leu Val Glu Glu Asn Thr
35 40 45

Ala Leu Arg Leu Glu Asn Ser Lys Leu Arg Glu Arg Leu Gly Glu Val
50 55 60

Glu Ala Asp Ala Pro Val Lys Ala Lys His Val Arg Glu Ser Val Arg
65 70 75 80

Arg Ile Tyr Arg Asp Gly Phe His Val Cys Asn Asp Phe Tyr Gly Gln
85 90 95

Arg Arg Glu Gln Asp Glu Glu Cys Met Phe Cys Asp Glu Leu Leu Tyr
100 105 110

Arg Glu

<210> 133

<211> 639

<212> DNA

<213> Streptococcus pneumoniae

<400> 133

atgtcaaaag gatttttagt ctctctttag ggaccagagg gagcaggcaa gaccagtgtt 60
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 cctggcggag tcttgattgg ggagaagatt cgccaagtga ttttggatcc aagtctact 180
 cagatggatg ctaaaacaga gctacttctc tatattgcca gtcgcagaca gcatttggtg 240
 gaaaaagttc ttccagccct tgaagctggc aagttggtca tcattggatcg ttttatcgat 300
 agttctgttg cctatcaggg atttggtcgt ggcttagata ttgaagccat tgactggctc 360
 aatcagtttg cgacagatgg cctcaaaccg gatttgacac tctatttga catcgaggtg 420
 gaagaagggc tggctcgtat tgctgcta atgtgaccgcg aggttaatcg tttggatttg 480
 gaagggttgg acttgcataa aaaagttcgt caaggctacc tttctcttct ggataaagag 540
 gaaaatcgca ttgtcaagat tgatgctagt ctcccttgg agcaagttgt ggaaactacc 600
 aaggctgtct tggtagacgg aatggccttgc gccaatga 639

<210> 134

<211> 212

<212> PRT

<213> Streptococcus pneumoniae

<400> 134

Met Ser Lys Gly Phe Leu Val Ser Leu Glu Gly Pro Glu Gly Ala Gly			
1	5	10	15

Lys Thr Ser Val Leu Glu Ala Leu Leu Pro Ile Leu Glu Glu Lys Gly			
20	25	30	

Val Glu Val Leu Thr Thr Arg Glu Pro Gly Gly Val Leu Ile Gly Glu			
35	40	45	

Lys Ile Arg Glu Val Ile Leu Asp Pro Ser His Thr Gln Met Asp Ala			
50	55	60	

Lys Thr Glu Leu Leu Tyr Ile Ala Ser Arg Arg Gln His Leu Val			
65	70	75	80

Glu Lys Val Leu Pro Ala Leu Glu Ala Gly Lys Leu Val Ile Met Asp			
85	90	95	

Arg Phe Ile Asp Ser Ser Val Ala Tyr Gln Gly Phe Gly Arg Gly Leu
 100 105 110

Asp Ile Glu Ala Ile Asp Trp Leu Asn Gln Phe Ala Thr Asp Gly Leu
 115 120 125

Lys Pro Asp Leu Thr Leu Tyr Phe Asp Ile Glu Val Glu Glu Gly Leu
 130 135 140

Ala Arg Ile Ala Ala Asn Ser Asp Arg Glu Val Asn Arg Leu Asp Leu
 145 150 155 160

Glu Gly Leu Asp Leu His Lys Lys Val Arg Gln Gly Tyr Leu Ser Leu
 165 170 175

Leu Asp Lys Glu Gly Asn Arg Ile Val Lys Ile Asp Ala Ser Leu Pro
 180 185 190

Leu Glu Gln Val Val Glu Thr Thr Lys Ala Val Leu Phe Asp Gly Met
 195 200 205

Gly Leu Ala Lys
 210

<210> 135

<211> 474

<212> DNA

<213> Streptococcus pneumoniae

<400> 135

atggtagaac aaagaaaaatc aattaccatg aaagatgttgc cttagaaagc aggagttgt 60
 gttggactg tttcacgtgt aattaataaa gaaaaaggca ttaaagaagt aactttgaaa 120
 aaagtggAAC aacgcgattaa aactttgaat tacattccag attactacgc tagaggaatg 180
 aaaaaaaaaatc gaacagaaac gattgcaatc attgtaccaa gtatctggca tcccttcTTT 240
 tcagaatttg ctatgcATGT ggAAAATGAA gtctataaga gaaataacaa attactctta 300
 tggtatca atggtacaaa tagagagcaa gactatctgg agatgttgCG tcataataaa 360

gttgatggag tggttgccat tacctataagg ccaattgaac attacttgac gtcaggaatt 420
 cccttggta gtattgaccg cacatactca gagattgcca ttcccttgtt ttca 474

<210> 136

<211> 158

<212> PRT

<213> Streptococcus pneumoniae

<400> 136

Met Val Glu Gln Arg Lys Ser Ile Thr Met Lys Asp Val Ala Leu Glu

1

5

10

15

Ala Gly Val Ser Val Gly Thr Val Ser Arg Val Ile Asn Lys Glu Lys

20

25

30

Gly Ile Lys Glu Val Thr Leu Lys Lys Val Glu Gln Ala Ile Lys Thr

35

40

45

Leu Asn Tyr Ile Pro Asp Tyr Tyr Ala Arg Gly Met Lys Lys Asn Arg

50

55

60

Thr Glu Thr Ile Ala Ile Ile Val Pro Ser Ile Trp His Pro Phe Phe

65

70

75

80

Ser Glu Phe Ala Met His Val Glu Asn Glu Val Tyr Lys Arg Asn Asn

85

90

95

Lys Leu Leu Leu Cys Ser Ile Asn Gly Thr Asn Arg Glu Gln Asp Tyr

100

105

110

Leu Glu Met Leu Arg His Asn Lys Val Asp Gly Val Val Ala Ile Thr

115

120

125

Tyr Arg Pro Ile Glu His Tyr Leu Thr Ser Gly Ile Pro Phe Val Ser

130

135

140

Ile Asp Arg Thr Tyr Ser Glu Ile Ala Ile Pro Cys Val Ser
 145 150 155

<210> 137
<211> 374
<212> DNA
<213> *Streptococcus pneumoniae*

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<400> 137  
atgaatatata tttagaacaaa gaatgttagt tttagataaaa cagagatgca taggcatttg 60  
aagttagtggg atttgatttt gctgggtatc ggagccatgg tagggacagg cgtctttaca 120  
atcacaggtt ctgcagctgc aacacttgct ggcccagccc tagtgatttc aatcgttatt 180  
tctgccttgt gtgtgggatt atcagccctc tttttgcag aatttgccctc gcgagttaccc 240  
gctacaggag gtgcctatacg ttacacctat gctatcttag gagaattccc tgcctgggt 300  
gctgggtggtaaaccatgat ggagttcatg acagccatata caggcgttagc ttcgggttgg 360  
qcaqcttatt ttaa 374
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<210> 138
<211> 124
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 138
Met Asn Ile Phe Arg Thr Lys Asn Val Ser Leu Asp Lys Thr Glu Met
1 5 10 15

His Arg His Leu Lys Leu Trp Asp Leu Ile Leu Leu Gly Ile Gly Ala
 29 25 30

Met Val Gly Thr Gly Val Phe Thr Ile Thr Gly Thr Ala Ala Ala Thr
35 40 45

Leu Ala Gly Pro Ala Leu Val Ile Ser Ile Val Ile Ser Ala Leu Cys
50 55 60

Val Gly Leu Ser Ala Leu Phe Phe Ala Glu Phe Ala Ser Arg Val Pro
 65 70 75 80

Ala Thr Gly Gly Ala Tyr Ser Tyr Leu Tyr Ala Ile Leu Gly Glu Phe
 85 90 95

Pro Ala Trp Leu Ala Gly Trp Leu Thr Met Met Glu Phe Met Thr Ala
 100 105 110

Ile Ser Gly Val Ala Ser Gly Trp Ala Ala Tyr Phe
 115 120

<210> 139

<211> 1311

<212> DNA

<213> Streptococcus pneumoniae

<400> 139

atgaaatcaa gagtaaagga aacgagtatg gataaaaattg tggttcaagg tggcgataat 60
 cgtctggtag gaagcgtgac gatcgaggga gcaaaaaatg cagtcttacc cttgttggca 120
 gcgactattc tagcaagtga aggaaagacc gtcttcaga atgttccgat tttgtcggat 180
 gtctttatta tgaatcaggt agttgggtgt ttgaatgcc aagttgactt tgatgaggaa 240
 gctcatcttg tcaagggtgga tgctactggc gacatcactg aggaagcccc ttacaagtat 300
 gtcagcaaga tgcgcgcctc catcggtgta ttagggccaa tccttgcggc tgtgggtcat 360
 gccaaggat ccatgccagg tggtgtacg attggtagcc gtcctattga tcttcatttg 420
 aaaggtctgg aagctatggg ggttaagatt agtcagacag ctggttacat cgaagccaag 480
 gcagaacgcgt tgcattgtgc tcataatctat atggactttc caagtgttgg tgcaacgcag 540
 aacttgcatttgc tggcagcgac tctggctgat ggggtgacag tgattgagaa tgctgcgcgt 600
 gagcctgaga ttgttgcatt agccattctc cttaatgaaa tgggagccaa ggtcaaagggt 660
 gctggtagcag agactataac cattacttgtt gttgagaaac ttcatggtag gactcacaat 720
 gtagtccaag accgtatcga agcaggaacc tttatggtag ctgctgcatt gactgggtgt 780
 gatgtcttgc ttcgagacgc tgcattggtag cacaaccgtc ccttgcattgc caagttactt 840
 gaaatgggtg ttgaagtaat tgaagaagac gaaggaattc gtgttcgttc tcaactagaa 900
 aatctaataaag ctgttgcattt gaaaacccctt ccccacccag gatttccaaac agatatgcag 960
 gctcaatttgc tggcatttttgc gacagttgc aaaggcgaat caaccatggt ggagacagttt 1020
 ttcgaaaatc gtttccaaaca ctttgcatttgc aatgcgcgttgc tggcattttgc ttctgagatt 1080

atccgtgata cagctcgat tgggtggc cagccttgc agggagcaga agttttca 1140
 actgaccctc gtgccagtgc ggcccttgatt ttgacagggtt tgtagcaca gggagaaact 1200
 gtggtcggtta aattggttca ctggataga ggtaactacg gttccatga gaagttggcg 1260
 cagctaggta ctaagattca gcggattgag gcaagtgtat aagatgaata a 1311

<210> 140

<211> 436

<212> PRT

<213> Streptococcus pneumoniae

<400> 140

Met Lys Ser Arg Val Lys Glu Thr Ser Met Asp Lys Ile Val Val Gln

1

5

10

15

Gly Gly Asp Asn Arg Leu Val Gly Ser Val Thr Ile Glu Gly Ala Lys

20

25

30

Asn Ala Val Leu Pro Leu Leu Ala Ala Thr Ile Leu Ala Ser Glu Gly

35

40

45

Lys Thr Val Leu Gln Asn Val Pro Ile Leu Ser Asp Val Phe Ile Met

50

55

60

Asn Gln Val Val Gly Gly Leu Asn Ala Lys Val Asp Phe Asp Glu Glu

65

70

75

80

Ala His Leu Val Lys Val Asp Ala Thr Gly Asp Ile Thr Glu Glu Ala

85

90

95

Pro Tyr Lys Tyr Val Ser Lys Met Arg Ala Ser Ile Val Val Leu Gly

100

105

110

Pro Ile Leu Ala Arg Val Gly His Ala Lys Val Ser Met Pro Gly Gly

115

120

125

Cys Thr Ile Gly Ser Arg Pro Ile Asp Leu His Leu Lys Gly Leu Glu

130

135

140

Ala Met Gly Val Lys Ile Ser Gln Thr Ala Gly Tyr Ile Glu Ala Lys
145 150 155 160

Ala Glu Arg Leu His Gly Ala His Ile Tyr Met Asp Phe Pro Ser Val
165 170 175

Gly Ala Thr Gln Asn Leu Met Met Ala Ala Thr Leu Ala Asp Gly Val
180 185 190

Thr Val Ile Glu Asn Ala Ala Arg Glu Pro Glu Ile Val Asp Leu Ala
195 200 205

Ile Leu Leu Asn Glu Met Gly Ala Lys Val Lys Gly Ala Gly Thr Glu
210 215 220

Thr Ile Thr Ile Thr Gly Val Glu Lys Leu His Gly Thr Thr His Asn
225 230 235 240

Val Val Gln Asp Arg Ile Glu Ala Gly Thr Phe Met Val Ala Ala Ala
245 250 255

Met Thr Gly Gly Asp Val Leu Ile Arg Asp Ala Val Trp Glu His Asn
260 265 270

Arg Pro Leu Ile Ala Lys Leu Leu Glu Met Gly Val Glu Val Ile Glu
275 280 285

Glu Asp Glu Gly Ile Arg Val Arg Ser Gln Leu Glu Asn Leu Lys Ala
290 295 300

Val His Val Lys Thr Leu Pro His Pro Gly Phe Pro Thr Asp Met Gln
305 310 315 320

Ala Gln Phe Thr Ala Leu Met Thr Val Ala Lys Gly Glu Ser Thr Met
325 330 335

Val Glu Thr Val Phe Glu Asn Arg Phe Gln His Leu Glu Glu Met Arg
340 345 350

Arg Met Gly Leu His Ser Glu Ile Ile Arg Asp Thr Ala Arg Ile Val
355 360 365

Gly Gly Gln Pro Leu Gln Gly Ala Glu Val Leu Ser Thr Asp Leu Arg
370 375 380

Ala Ser Ala Ala Leu Ile Leu Thr Gly Leu Val Ala Gln Gly Glu Thr
 385 390 395 400

Val Val Gly Lys Leu Val His Leu Asp Arg Gly Tyr Tyr Gly Phe His
405 410 415

Glu Lys Leu Ala Gln Leu Gly Ala Lys Ile Gln Arg Ile Glu Ala Ser
420 425 430

Asp Glu Asp Glu
435

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<210> 141  
<211> 1101  
<212> DNA  
<213> Streptococcus pneumoniae
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<400> 141
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gaagttcttt ggactgcacg tagtgtttag caaatccaaa acgatttgac taaaacggac 120
aacaaaacaa gttataccgt acagtatggc gatactttga gcaccattgc agaagcctg 180
ggtgttagatg tcacagtgc tgcgaaatctg aacaaaatca ctaatatgga cttgatttc 240
ccagaaaactg ttttgacaac gactgtcaat gaagcagaag aagtaacaga agttgaaatc 300
caaacaccc tc aaggcagactc tagtgaagaa gtgacaactg cgacagcaga tttgaccact 360
aatcaagtga ccgttgatga tcaaactgtt caggttgcag acctttctca accaattgca 420
gaagttacaa agacagtgtat tgcttctgaa gaagtggcac catctacggg cacttctgtc 480
ccagaggagc aaacgaccga aacaactcgc ccagttgcag aagaagctcc tcaggaaacg 540
actccagctg agaagcagga aacacaaaaca agccctcaag ctgcattcgc agtggaaagca 600
actacaacaa gttcagaagc aaaagaagta gcatcatcaa atggagctac agcagcagtt 660
tctacttatac aaccagaaga aacgaaagta atttcaacaa cttacgaggc tccagctgcg 720

Thr Val Gln Val Ala Asp Leu Ser Gln Pro Ile Ala Glu Val Thr Lys
130 135 140

Thr Val Ile Ala Ser Glu Glu Val Ala Pro Ser Thr Gly Thr Ser Val
145 150 155 160

Pro Glu Glu Gln Thr Thr Glu Thr Thr Arg Pro Val Ala Glu Glu Ala
165 170 175

Pro Gln Glu Thr Thr Pro Ala Glu Lys Gln Glu Thr Gln Thr Ser Pro
180 185 190

Gln Ala Ala Ser Ala Val Glu Ala Thr Thr Ser Ser Glu Ala Lys
195 200 205

Glu Val Ala Ser Ser Asn Gly Ala Thr Ala Ala Val Ser Thr Tyr Gln
210 215 220

Pro Glu Glu Thr Lys Val Ile Ser Thr Thr Tyr Glu Ala Pro Ala Ala
225 230 235 240

Pro Asp Tyr Ala Gly Leu Ala Val Ala Lys Ser Glu Asn Ala Gly Leu
245 250 255

Gln Pro Gln Thr Ala Ala Phe Lys Lys Lys Leu Leu Thr Cys Leu Ala
260 265 270

Leu His Pro Leu Val Val Ile Val Gln Glu Thr Val Glu Ile Thr Glu
275 280 285

Lys Val Trp Leu Ser Thr Leu Trp Tyr Gln Asn Val Gln Asn
290 295 300

<210> 143

<211> 1281

<212> DNA

<213> Streptococcus pneumoniae

<400> 143

ttgtttaaga aaaataaaaga cattcttaat attgcattgc cagctatggg tgaaaacttt 60
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 atttcagggg tttcagtagc tggtaatatt atcaccattt atcaggcgat tttcatcgct 180
 ctgggagctg ctatccag tggatttca aaaagcatag ggcagaaaaga ccagtcgaag 240
 ttggcctatc atgtgactga ggcgttgaag attacccatc tattaagttt ccttttagga 300
 ttttgcgtcca tcttcgttgg gaaagagatg ataggacttt tggggacgga gagggatgt 360
 gctgagatg gtggactgttgc tctatcttg gtagggcgat cgattgttct ctttaggttta 420
 atgactatgc taggacgcctt gattcgtgca acgcataatc cacgtctgcc tctctatgtt 480
 agtttttat ccaatgcctt gaatattctt tttcaagtc tagctatttt tggtctggat 540
 atggggatag ctgggtttgc ttggggaca attgtgttgc gtttggttgg tcttgtgatt 600
 ttgtgtcac aattaaaact gccttatggg aagccaaactt ttgggtttaga taaggaactg 660
 ttgaccttgg cttaaccaggc agctggagag cgacttatga tgagggttgg agatgttagt 720
 atcattgcct tggtcgttgc ttttggacg gaggcagtttgc tggggatgc aatcgagaa 780
 gtcttgaccc agtttaacta tatgcctgccc tttggcgatcg ctacggcaac ggtcatgtt 840
 ttggcccgag cagttggaga ggatgattgg aaaagagtttgc ttagtttgag taaacaaacc 900
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 tatatgagct tgaaaggata g 1281

<210> 144

<211> 426

<212> PRT

<213> Streptococcus pneumoniae

<400> 144

Leu Phe Lys Lys Asn Lys Asp Ile Leu Asn Ile Ala Leu Pro Ala Met

Gly Glu Asn Phe Leu Gln Met Leu Met Gly Met Val Asp Ser Tyr Leu
20 25 30

Val Ala His Leu Gly Leu Ile Ala Ile Ser Gly Val Ser Val Ala Gly
35 40 45

Asn Ile Ile Thr Ile Tyr Gln Ala Ile Phe Ile Ala Leu Gly Ala Ala
50 55 60

Ile Ser Ser Val Ile Ser Lys Ser Ile Gly Gln Lys Asp Gln Ser Lys
65 70 75 80

Leu Ala Tyr His Val Thr Glu Ala Leu Lys Ile Thr Leu Leu Leu Ser
85 90 95

Phe Leu Leu Gly Phe Leu Ser Ile Phe Ala Gly Lys Glu Met Ile Gly
100 105 110

Leu Leu Gly Thr Glu Arg Asp Val Ala Glu Ser Gly Gly Leu Tyr Leu
115 120 125

Ser Leu Val Gly Gly Ser Ile Val Leu Leu Gly Leu Met Thr Ser Leu
130 135 140

Gly Ala Leu Ile Arg Ala Thr His Asn Pro Arg Leu Pro Leu Tyr Val
145 150 155 160

Ser Phe Leu Ser Asn Ala Leu Asn Ile Leu Phe Ser Ser Leu Ala Ile
165 170 175

Phe Val Leu Asp Met Gly Ile Ala Gly Val Ala Trp Gly Thr Ile Val
180 185 190

Ser Arg Leu Val Gly Leu Val Ile Leu Trp Ser Gln Leu Lys Leu Pro
195 200 205

Tyr Gly Lys Pro Thr Phe Gly Leu Asp Lys Glu Leu Leu Thr Leu Ala
210 215 220

Leu Pro Ala Ala Gly Glu Arg Leu Met Met Arg Ala Gly Asp Val Val
225 230 235 240

Ile Ile Ala Leu Val Val Ser Phe Gly Thr Glu Ala Val Ala Gly Asn
245 250 255

Ala Ile Gly Glu Val Leu Thr Gln Phe Asn Tyr Met Pro Ala Phe Gly
260 265 270

Val Ala Thr Ala Thr Val Met Leu Leu Ala Arg Ala Val Gly Glu Asp
275 280 285

Asp Trp Lys Arg Val Ala Ser Leu Ser Lys Gln Thr Phe Trp Leu Ser
290 295 300

Leu Phe Leu Met Leu Pro Leu Ser Phe Ser Ile Tyr Val Leu Gly Val
305 310 315 320

Pro Leu Thr His Leu Tyr Thr Thr Asp Ser Leu Ala Val Glu Ala Ser
325 330 335

Val Leu Val Thr Leu Phe Ser Leu Leu Gly Thr Pro Met Thr Thr Gly
340 345 350

Thr Val Ile Tyr Thr Ala Val Trp Gln Gly Leu Gly Asn Ala Arg Leu
355 360 365

Pro Phe Tyr Ala Thr Ser Ile Gly Met Trp Cys Ile Arg Ile Gly Thr
370 375 380

Gly Tyr Leu Met Gly Ile Val Leu Gly Trp Gly Leu Pro Gly Ile Trp
385 390 395 400

Ala Gly Ser Leu Leu Asp Asn Gly Phe Arg Trp Leu Phe Leu Arg Tyr
405 410 415

Arg Tyr Gln Arg Tyr Met Ser Leu Lys Gly
420 425

<210> 145
<211> 894
<212> DNA
<213> *Streptococcus pneumoniae*

<400> 145
gtgggaagaa ttatcagagc aggtgtaaag atggaacatc ttggaaaagt atttcgtgaa 60
tttcgaacaa gtggaaatta ttctttaaag gaagcagcag gcgaatcctg ctctacctt 120
cagttatctc gcttgagct tggggagtc gacctggcag tctcccgttt ctttgagatt 180
ttggataaca ttcatgtAAC aatcgAAAAT ttcatggata aggcaaggaa ttttcataat 240
catgaacatg tgtcttatgtat ggcacagatt atcccactt actattcaaa cgatattgca 300
ggttttcaaa agcttcaaag agaacaactt gaaaagtcta agagttcgac gactccccctt 360
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gatatgaagc aggatgattt gggtaaggta gcagattatc tcttcaaaac agaagaatgg 480
accatgtatg agttgatttct tttcgtaac ctctatagtt tctacgatgt agactatgtc 540
actcggattt gtagagaagt tatggagagg gaggaatttt accaagagat tagtcgcatt 600
aagagattt tagttgatTTT ggccctcaat tgttaccagc attgtttaga gcattcttct 660
ttttataatg ccaactattt tgaggcttat acagagaaga ttattgacAA aggtattaag 720
ctttatgagc gtaatgtttt ccattatttA aaaggTTTg ccttataatca aaaaggacag 780
tgtaaagaag gctgtaaAGCA gatgcaagag gccatgcata ttttgatgt gttaggtctt 840
ccagagcaag tagccttatttA tcaggaacac tacgAAAAT ttgtcaAAAG ttAA 894

<210> 146
<211> 297
<212> PRT
<213> *Streptococcus pneumoniae*

<400> 146
Val Gly Arg Ile Ile Arg Ala Gly Val Lys Met Glu His Leu Gly Lys
1 5 10 15

Val Phe Arg Glu Phe Arg Thr Ser Gly Asn Tyr Ser Leu Lys Glu Ala
20 25 30

Ala Gly Glu Ser Cys Ser Thr Ser Gln Leu Ser Arg Phe Glu Leu Gly
35 40 45

Glu Ser Asp Leu Ala Val Ser Arg Phe Phe Glu Ile Leu Asp Asn Ile
50 55 60

His Val Thr Ile Glu Asn Phe Met Asp Lys Ala Arg Asn Phe His Asn
65 70 75 80

His Glu His Val Ser Met Met Ala Gln Ile Ile Pro Leu Tyr Tyr Ser
85 90 95

Asn Asp Ile Ala Gly Phe Gln Lys Leu Gln Arg Glu Gln Leu Glu Lys
100 105 110

Ser Lys Ser Ser Thr Thr Pro Leu Tyr Phe Glu Leu Asn Trp Ile Leu
115 120 125

Leu Gln Gly Leu Ile Cys Gln Arg Asp Ala Ser Tyr Asp Met Lys Gln
130 135 140

Asp Asp Leu Gly Lys Val Ala Asp Tyr Leu Phe Lys Thr Glu Glu Trp
145 150 155 160

Thr Met Tyr Glu Leu Ile Leu Phe Gly Asn Leu Tyr Ser Phe Tyr Asp
165 170 175

Val Asp Tyr Val Thr Arg Ile Gly Arg Glu Val Met Glu Arg Glu Glu
180 185 190

Phe Tyr Gln Glu Ile Ser Arg His Lys Arg Leu Val Leu Ile Leu Ala
195 200 205

Leu Asn Cys Tyr Gln His Cys Leu Glu His Ser Ser Phe Tyr Asn Ala
210 215 220

Asn Tyr Phe Glu Ala Tyr Thr Glu Lys Ile Ile Asp Lys Gly Ile Lys
225 230 235 240

200

Leu Tyr Glu Arg Asn Val Phe His Tyr Leu Lys Gly Phe Ala Leu Tyr
245 250 255

Gln Lys Gly Gln Cys Lys Glu Gly Cys Lys Gln Met Gln Glu Ala Met
260 265 270

His Ile Phe Asp Val Leu Gly Leu Pro Glu Gln Val Ala Tyr Tyr Gln
275 280 285

Glu His Tyr Glu Lys Phe Val Lys Ser
290 295

<210> 147

<211> 1068

<212> DNA

<213> Streptococcus pneumoniae

<400> 147

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cagcgcggta ttctttattc tatgaataag gatagcaata ctttgacaa gagctaccgt 180
aagtccggcca agtcagtcgg gaacatcatg ggaaatttcc acccacacgg ggattcttct 240
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atgcacggta ataacggttc tatggacgga gatcttcctg cggctatgcg ttatactgag 360
gcacgtttgt ctgaaattgc aggctacctt cttcaggata tcgagaaaaa gacagttcct 420
tttgcatgga actttgacga tacggagaaa gaaccaacgg tcttgccagc agcctttcca 480
aacctcttgg tcaatggttc gactgggatt tcggctgggtt atgccacaga cattcctccc 540
cataatttag ctgaggtcat agatgctgca gtttacatga ttgaccaccc aactgcaaag 600
attgataaac tcatggaatt cttgcctgga ccagacttcc ctacaggggc tattattcag 660
ggtcgtgatg aaatcaagaa agcttatgag actggggaaag ggcgcgtgggt tgttcggttcc 720
aagactgaaaa ttgaaaaagct aaaaggtggt aaggaacaaa tcgttattat tgagattcct 780
tatgaaatca ataaggccaa tctagtcaag aaaatcgatg atgttcgtgt taataacaag 840
gtagctggga ttgctgaggt tcgtgatgag tctgaccgtg atggcttcc tatacgatc 900
gaacttaaga aagacgctaa tactgagctt gttctcaact acttattaa gtacaccgac 960
ctacaaatca actacaactt taatatggtg gcgattgaca atttcacacc tcgtcagggtt 1020
ggattgttcc aatcctgtct agctatatcg ctcaccgtcg agaagtga 1068

<210> 148

<211> 355

<212> PRT

<213> Streptococcus pneumoniae

<400> 148

Met Ser Asn Ile Gln Asn Met Ser Leu Glu Asp Ile Met Gly Glu Arg
1 5 10 15

Phe Gly Arg Tyr Ser Lys Tyr Ile Ile Gln Asp Arg Ala Leu Pro Asp
20 25 30

Ile Arg Asp Gly Leu Lys Pro Val Gln Arg Arg Ile Leu Tyr Ser Met
35 40 45

Asn Lys Asp Ser Asn Thr Phe Asp Lys Ser Tyr Arg Lys Ser Ala Lys
50 55 60

Ser Val Gly Asn Ile Met Gly Asn Phe His Pro His Gly Asp Ser Ser
65 70 75 80

Ile Tyr Asp Ala Met Val Arg Met Ser Gln Asn Trp Lys Asn Arg Glu
85 90 95

Ile Leu Val Glu Met His Gly Asn Asn Gly Ser Met Asp Gly Asp Pro
100 105 110

Pro Ala Ala Met Arg Tyr Thr Glu Ala Arg Leu Ser Glu Ile Ala Gly
115 120 125

Tyr Leu Leu Gln Asp Ile Glu Lys Lys Thr Val Pro Phe Ala Trp Asn
130 135 140

Phe Asp Asp Thr Glu Lys Glu Pro Thr Val Leu Pro Ala Ala Phe Pro
145 150 155 160

Asn Leu Leu Val Asn Gly Ser Thr Gly Ile Ser Ala Gly Tyr Ala Thr
165 170 175

Asp Ile Pro Pro His Asn Leu Ala Glu Val Ile Asp Ala Ala Val Tyr
180 185 190

Met Ile Asp His Pro Thr Ala Lys Ile Asp Lys Leu Met Glu Phe Leu
195 200 205

Pro Gly Pro Asp Phe Pro Thr Gly Ala Ile Ile Gln Gly Arg Asp Glu
210 215 220

Ile Lys Lys Ala Tyr Glu Thr Gly Lys Gly Arg Val Val Val Arg Ser
225 230 235 240

Lys Thr Glu Ile Glu Lys Leu Lys Gly Gly Lys Glu Gln Ile Val Ile
245 250 255

Ile Glu Ile Pro Tyr Glu Ile Asn Lys Ala Asn Leu Val Lys Lys Ile
260 265 270

Asp Asp Val Arg Val Asn Asn Lys Val Ala Gly Ile Ala Glu Val Arg
275 280 285

Asp Glu Ser Asp Arg Asp Gly Leu Arg Ile Ala Ile Glu Leu Lys Lys
290 295 300

Asp Ala Asn Thr Glu Leu Val Leu Asn Tyr Leu Phe Lys Tyr Thr Asp
305 310 315 320

Leu Gln Ile Asn Tyr Asn Phe Asn Met Val Ala Ile Asp Asn Phe Thr
325 330 335

Pro Arg Gln Val Gly Leu Phe Gln Ser Cys Leu Ala Ile Ser Leu Thr
340 345 350

Val Glu Lys
355

<210> 149

<211> 684

<212> DNA

<213> Streptococcus pneumoniae

<400> 149

atggccgacat tagaaatagc aaaaaaaaaa ctggagttca ttaagaaggc agaagaatat 60
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acttctgtta accctgggga aggaaaaaaca actacttcca taaatatagc atggtcgtt 180
gcmcgtgcag gctataaaac tctttgatc gatggcgata ctcgaaattc agttatgtta 240
ggagtttta aatctcgtga aaaaattaca gggctaacag aatttttatac tgggacagct 300
gatttatctc acggtttatg tgatacaat attgaaaatt tatttgtatc tcaatcgaa 360
tctgtatcac caaacccctac agccttgtta caaagtaaaaa attttaatga tatgattgaa 420
acattgcgta aatattttga ttatatcatt attgatacac cgcctattgg aattgttatt 480
gatgcggcaa ttatcactca aaagtgtgat gcgtccatct tggtaacagc aacaggtgag 540
gccaataaaac gtgatatcca aaaagcgaaa caacaattaa aacaaacagg gaaactgttc 600
cttaggagttg ttttaaataa attggatatac tcggtaata agtatggagt ttacgggtcc 660
tatqgaaatt atggtaaaaaa ataa 684

<210> 150

<211> 227

<212> PRT

<213> *Streptococcus pneumoniae*

<400> 150

Met Pro Thr Leu Glu Ile Ala Gln Lys Lys Leu Glu Phe Ile Lys Lys

1

5

10

15

Ala Glu Glu Tyr Tyr Asn Ala Leu Cys Thr Asn Ile Gln Leu Ser Gly

20

25

30

Asp Lys Leu Lys Val Ile Ser Val Thr Ser Val Asn Pro Gly Glu Gly

35

40

45

Lys Thr Thr Ser Ile Asn Ile Ala Trp Ser Phe Ala Arg Ala Gly

50 55 60

Tyr Lys Thr Leu Leu Ile Asp Gly Asp Thr Arg Asn Ser Val Met Leu

65 70 75 80

Gly Val Phe Lys Ser Arg Glu Lys Ile Thr Gly Leu Thr Glu Phe Leu

85 90 95

Ser Gly Thr Ala Asp Leu Ser His Gly Leu Cys Asp Thr Asn Ile Glu

100 105 110

Asn Leu Phe Val Val Gln Ser Gly Ser Val Ser Pro Asn Pro Thr Ala

115 120 125

Leu Leu Gln Ser Lys Asn Phe Asn Asp Met Ile Glu Thr Leu Arg Lys

130 135 140

Tyr Phe Asp Tyr Ile Ile Ile Asp Thr Pro Pro Ile Gly Ile Val Ile

145 150 155 160

Asp Ala Ala Ile Ile Thr Gln Lys Cys Asp Ala Ser Ile Leu Val Thr

165 170 175

Ala Thr Gly Glu Ala Asn Lys Arg Asp Ile Gln Lys Ala Lys Gln Gln

180 185 190

Leu Lys Gln Thr Gly Lys Leu Phe Leu Gly Val Val Leu Asn Lys Leu

195 200 205

Asp Ile Ser Val Asn Lys Tyr Gly Val Tyr Gly Ser Tyr Gly Asn Tyr

210 215 220

Gly Lys Lys

225

<210> 151

<211> 1194

<212> DNA

<213> Streptococcus pneumoniae

<400> 151

atggaggcaa atatgaaaaca tctaaaaaca ttttacaaaa aatggttca attattagtc 60
 gttatcgta tttagctttt tagtggagcc ttgggttagtt tttcaataac tcaactaact 120
 caaaaaagta gtgtaaacaa ctctaacaac aatagtacta ttacacaaac tgcctataag 180
 aacgaaaatt caacaacaca ggctgttaac aaagtaaaag atgctgttgt ttctgttatt 240
 acttattcgg caaacagaca aaatagcgta tttggcaatg atgatactga cacagattct 300
 cagcgaatct ctagtgaagg atctggagtt atttataaaa agaatgataa agaagcttac 360
 atcgtcacca acaatcacgt tattaatggc gccagcaaag tagatattcg attgtcagat 420
 gggactaaag tacctggaga aattgtcgga gctgacactt tctctgatat tgctgtcgtc 480
 aaaatctctt cagaaaaagt gacaacagta gctgagtttg gtgattctag taagttact 540
 gtaggagaaa ctgctattgc catcggtagc ccgttaggtt ctgaatatgc aaatactgtc 600
 actcaaggta tcgtatccag tctcaataga aatgtatcct taaaatcggg agatggacaa 660
 gctatttcta caaaagccat ccaaactgat actgttattt acccaggtaa ctctggcgcc 720
 ccactgatca atattcaagg gcaggttacg ggaatttacct caagtaaaat tgctacaat 780
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 attgaacagt tagaaaaaaaaa cgaaaaagtg acgcgtccag ctttggaaat ccagatggtt 900
 aatttatcta atgtgagttac aagcgacatc agaagactca atattccaag taatgttaca 960
 tctgggttaa ttgttcgttc ggtacaaaagt aatatgcctg ccaatggta ctttgaaaaa 1020
 tacgatgttaa ttacaaaagt agatgacaaa gagattgctt catcaacaga cttacaaaagt 1080
 gctcttaca accattctat cggagacacc attaagataa cctactatcg taacggaaaa 1140
 gaagaaaacta cctctatcaa acttaacaag agttcaggtg atttagaatc ttaa 1194

<210> 152

<211> 397

<212> PRT

<213> Streptococcus pneumoniae

<400> 152

Met Glu Ala Asn Met Lys His Leu Lys Thr Phe Tyr Lys Lys Trp Phe

1

5

10

15

Gln Leu Leu Val Val Ile Val Ile Ser Phe Phe Ser Gly Ala Leu Gly

20

25

30

Ser Phe Ser Ile Thr Gln Leu Thr Gln Lys Ser Ser Val Asn Asn Ser

35

40

45

Asn Asn Asn Ser Thr Ile Thr Gln Thr Ala Tyr Lys Asn Glu Asn Ser

50

55

60

Thr Thr Gln Ala Val Asn Lys Val Lys Asp Ala Val Val Ser Val Ile

65

70

75

80

Thr Tyr Ser Ala Asn Arg Gln Asn Ser Val Phe Gly Asn Asp Asp Thr

85

90

95

Asp Thr Asp Ser Gln Arg Ile Ser Ser Glu Gly Ser Gly Val Ile Tyr

100

105

110

Lys Lys Asn Asp Lys Glu Ala Tyr Ile Val Thr Asn Asn His Val Ile

115

120

125

Asn Gly Ala Ser Lys Val Asp Ile Arg Leu Ser Asp Gly Thr Lys Val

130

135

140

Pro Gly Glu Ile Val Gly Ala Asp Thr Phe Ser Asp Ile Ala Val Val

145

150

155

160

Lys Ile Ser Ser Glu Lys Val Thr Thr Val Ala Glu Phe Gly Asp Ser

165

170

175

Ser Lys Leu Thr Val Gly Glu Thr Ala Ile Ala Ile Gly Ser Pro Leu

180

185

190

Gly Ser Glu Tyr Ala Asn Thr Val Thr Gln Gly Ile Val Ser Ser Leu

195

200

205

Asn Arg Asn Val Ser Leu Lys Ser Glu Asp Gly Gln Ala Ile Ser Thr

210

215

220

Lys Ala Ile Gln Thr Asp Thr Ala Ile Asn Pro Gly Asn Ser Gly Gly
225 230 235 240

Pro Leu Ile Asn Ile Gln Gly Gln Val Ile Gly Ile Thr Ser Ser Lys
245 250 255

Ile Ala Thr Asn Gly Gly Thr Ser Val Glu Gly Leu Gly Phe Ala Ile
260 265 270

Pro Ala Asn Asp Ala Ile Asn Ile Ile Glu Gln Leu Glu Lys Asn Gly
275 280 285

Lys Val Thr Arg Pro Ala Leu Gly Ile Gln Met Val Asn Leu Ser Asn
290 295 300

Val Ser Thr Ser Asp Ile Arg Arg Leu Asn Ile Pro Ser Asn Val Thr
305 310 315 320

Ser Gly Val Ile Val Arg Ser Val Gln Ser Asn Met Pro Ala Asn Gly
325 330 335

His Leu Glu Lys Tyr Asp Val Ile Thr Lys Val Asp Asp Lys Glu Ile
340 345 350

Ala Ser Ser Thr Asp Leu Gln Ser Ala Leu Tyr Asn His Ser Ile Gly
355 360 365

Asp Thr Ile Lys Ile Thr Tyr Tyr Arg Asn Gly Lys Glu Glu Thr Thr
370 375 380

Ser Ile Lys Leu Asn Lys Ser Ser Gly Asp Leu Glu Ser
385 390 395

<210> 153

<211> 939

<212> DNA

<213> Streptococcus pneumoniae

<400> 153

atggcagaaa tttatctagc aggtgggtgt ttttggggcc tagaggaata tttttcacgc 60
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 taccaggttgc tcaaggaaac agaccatgca gaaacggtcc aagtgattta cgatgagaag 180
 gaagtgtcac tcagagagat tttactttat tatttcccgag ttatcgatcc tctatctatc 240
 aatcaacaag ggaatgaccg tggtcgcca tatcgaactg ggattttatta tcaggatgaa 300
 gcagatttgc cagctatcta cacagtggtg caggagcagg aacgcattgt gggtcgaaag 360
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 cgttcaggca gtgctcactt gggtcatgtt ttacagatg gaccgcggga gttaggcggc 840
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 gcaggatatg gctatctatt gccttactta aacaaataa 939

<210> 154

<211> 312

<212> PRT

<213> Streptococcus pneumoniae

<400> 154

Met Ala Glu Ile Tyr Leu Ala Gly Gly Cys Phe Trp Gly Leu Glu Glu

1

5

10

15

Tyr Phe Ser Arg Ile Ser Gly Val Leu Glu Thr Ser Val Gly Tyr Ala

20

25

30

Asn Gly Gln Val Glu Thr Thr Asn Tyr Gln Leu Leu Lys Glu Thr Asp

35

40

45

His Ala Glu Thr Val Gln Val Ile Tyr Asp Glu Lys Glu Val Ser Leu
50 55 60

Arg Glu Ile Leu Leu Tyr Tyr Phe Arg Val Ile Asp Pro Leu Ser Ile
65 70 75 80

Asn Gln Gln Gly Asn Asp Arg Gly Arg Gln Tyr Arg Thr Gly Ile Tyr
85 90 95

Tyr Gln Asp Glu Ala Asp Leu Pro Ala Ile Tyr Thr Val Val Gln Glu
100 105 110

Gln Glu Arg Met Leu Gly Arg Lys Ile Ala Val Glu Val Glu Gln Leu
115 120 125

Arg His Tyr Ile Leu Ala Glu Asp Tyr His Gln Asp Tyr Leu Arg Lys
130 135 140

Asn Pro Ser Gly Tyr Cys His Ile Asp Val Thr Asp Ala Asp Lys Pro
145 150 155 160

Leu Ile Asp Ala Ala Asn Tyr Glu Lys Pro Ser Gln Glu Val Leu Lys
165 170 175

Ala Ser Leu Ser Glu Glu Ser Tyr Arg Val Thr Gln Glu Ala Ala Thr
180 185 190

Glu Ala Pro Phe Thr Asn Ala Tyr Asp Gln Thr Phe Glu Glu Gly Ile
195 200 205

Tyr Val Asp Ile Thr Thr Gly Glu Pro Leu Phe Phe Ala Lys Asp Lys
210 215 220

Phe Ala Ser Gly Cys Gly Trp Pro Ser Phe Ser Arg Pro Ile Ser Lys
225 230 235 240

Glu Leu Ile His Tyr Tyr Lys Asp Leu Ser His Gly Met Glu Arg Ile
245 250 255

210

Glu Val Arg Ser Arg Ser Gly Ser Ala His Leu Gly His Val Phe Thr
260 265 270

Asp Gly Pro Arg Glu Leu Gly Gly Leu Arg Tyr Cys Ile Asn Ser Ala
275 280 285

Ser Leu Arg Phe Val Ala Lys Asp Glu Met Glu Lys Ala Gly Tyr Gly
290 295 300

Tyr Leu Leu Pro Tyr Leu Asn Lys
305 310

<210> 155

<211> 870

<212> DNA

<213> Streptococcus pneumoniae

<400> 155

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gaacaccaga ttggcaaattg gattccacat gacgagcgta atctcttgct caaaatcgct 180
ttgcaaattt taccagactt gcaaccaaga cgcttggaaa tgaccagtga tgtccctttg 240
gcgcgcgggtt tgggttcttc cagctcggtt atcggtgctg ggattgaact agccaaccaa 300
ctgggtcaac tcaacttatac agaccatgaa aaattgcagt tagcgaccaa gattgaagg 360
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ggcaagtct ctgctatcg agcagactt ccagagtgtg attttcttagc ttacatccaa 480
aactatgaat tacgtactcg cgacagccgt agtgtcttgc ctaaaaaatt gtcttataag 540
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tacctttctg gtgtggcc gacagttatg gttctggctt ctcatgacaa gatgccaaca 780
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<210> 156

<211> 289

<212> PRT

<213> Streptococcus pneumoniae

<400> 156

Met Lys Ile Ile Val Pro Ala Thr Ser Ala Asn Ile Gly Pro Gly Phe
1 5 10 15

Asp Ser Val Gly Val Ala Val Thr Lys Tyr Leu Gln Ile Glu Val Cys
20 25 30

Glu Glu Arg Asp Glu Trp Leu Ile Glu His Gln Ile Gly Lys Trp Ile
35 40 45

Pro His Asp Glu Arg Asn Leu Leu Leu Lys Ile Ala Leu Gln Ile Val
50 55 60

Pro Asp Leu Gln Pro Arg Arg Leu Lys Met Thr Ser Asp Val Pro Leu
65 70 75 80

Ala Arg Gly Leu Gly Ser Ser Ser Val Ile Val Ala Gly Ile Glu
85 90 95

Leu Ala Asn Gln Leu Gly Gln Leu Asn Leu Ser Asp His Glu Lys Leu
100 105 110

Gln Leu Ala Thr Lys Ile Glu Gly His Pro Asp Asn Val Ala Pro Ala
115 120 125

Ile Tyr Gly Asn Leu Val Ile Ala Ser Ser Val Glu Gly Gln Val Ser
130 135 140

Ala Ile Val Ala Asp Phe Pro Glu Cys Asp Phe Leu Ala Tyr Ile Pro
145 150 155 160

Asn Tyr Glu Leu Arg Thr Arg Asp Ser Arg Ser Val Leu Pro Lys Lys
165 170 175

Leu Ser Tyr Lys Glu Ala Val Ala Ala Ser Ser Ile Ala Asn Val Ala
 180 185 190

Val Ala Ala Leu Leu Ala Gly Asp Met Val Thr Ala Gly Gln Ala Ile
 195 200 205

Glu Gly Asp Leu Phe His Glu Arg Tyr Arg Gln Asp Leu Val Arg Glu
 210 215 220

Phe Ala Met Ile Lys Gln Val Thr Lys Glu Asn Gly Ala Tyr Ala Thr
 225 230 235 240

Tyr Leu Ser Gly Ala Gly Pro Thr Val Met Val Leu Ala Ser His Asp
 245 250 255

Lys Met Pro Thr Ile Lys Ala Glu Leu Glu Lys Gln Pro Phe Lys Gly
 260 265 270

Lys Leu His Asp Leu Arg Val Asp Thr Gln Gly Val Arg Val Glu Ala
 275 280 285

Lys

<210> 157

<211> 564

<212> DNA

<213> Streptococcus pneumoniae

<400> 157

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 gtcttatcaag ctttaaaggt ttctactcct tttgcgattg agacattcgc tcccaattta 180
 gagaattttt tagaaaaagta caaggaaaat gaagccagag agcttgaaca cccgattttta 240
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 ctttatcaa gagaaaaagta tcagatttgc tctggctttg tcattgggtga tcggccgatt 480
 gatatcgaag caggtcaagc tgccaggactt gatacccaact tgtttaccag tatcgtgaat 540
 ttaagacaag tattagacat ataa 564

<210> 158

<211> 187

<212> PRT

<213> Streptococcus pneumoniae

<400> 158

Met Lys Tyr His Asp Tyr Ile Trp Asp Leu Gly Gly Thr Leu Leu Asp
 1 5 10 15

Asn Tyr Glu Thr Ser Thr Ala Ala Phe Val Glu Thr Leu Ala Leu Tyr
 20 25 30

Gly Ile Thr Gln Asp His Asp Ser Val Tyr Gln Ala Leu Lys Val Ser
 35 40 45

Thr Pro Phe Ala Ile Glu Thr Phe Ala Pro Asn Leu Glu Asn Phe Leu
 50 55 60

Glu Lys Tyr Lys Glu Asn Glu Ala Arg Glu Leu Glu His Pro Ile Leu
 65 70 75 80

Phe Glu Gly Val Ser Asp Leu Leu Glu Asp Ile Ser Asn Gln Gly Gly
 85 90 95

Arg His Phe Leu Val Ser His Arg Asn Asp Gln Val Leu Glu Ile Leu
 100 105 110

Glu Lys Thr Ser Ile Ala Ala Tyr Phe Thr Glu Val Val Thr Ser Ser
 115 120 125

Ser Gly Phe Lys Arg Lys Pro Asn Pro Glu Ser Met Leu Tyr Leu Arg
 130 135 140

Glu Lys Tyr Gln Ile Ser Ser Gly Leu Val Ile Gly Asp Arg Pro Ile
 145 150 155 160

Asp Ile Glu Ala Gly Gln Ala Ala Gly Leu Asp Thr His Leu Phe Thr
 165 170 175

Ser Ile Val Asn Leu Arg Gln Val Leu Asp Ile
 180 185

<210> 159

<211> 1875

<212> DNA

<213> Streptococcus pneumoniae

<400> 159

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<210> 160

<211> 624

<212> PRT

<213> Streptococcus pneumoniae

<400> 160

Gln Ile Gln Val Leu Glu Gly Leu Glu Ala Val Arg Met Arg Pro Gly
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Met Tyr Ile Gly Ser Thr Ser Lys Glu Gly Leu His His Leu Val Trp
35 40 45

Glu Ile Val Asp Asn Ser Ile Asp Glu Ala Leu Ala Gly Phe Ala Ser
52 55 62

His Ile Gln Val Phe Ile Glu Pro Asp Asp Ser Ile Thr Val Val Asp
65 70 75 80

Asp Gly Arg Gly Ile Pro Val Asp Ile Gln Glu Lys Thr Gly Arg Pro

Ala Val Glu Thr Val Phe Thr Val Leu His Ala Gly Gly Lys Phe Gly
100 105 110

Gly Gly Gly Tyr Lys Val Ser Gly Gly Leu His Gly Val Gly Ser Ser
115 120 125

Val Val Asn Ala Leu Ser Thr Gln Leu Asp Val His Val His Lys Asn
130 135 140

Gly Lys Ile His Tyr Gln Glu Tyr Arg Arg Gly His Val Val Ala Asp
145 150 155 160

Leu Glu Ile Val Gly Asp Thr Asp Lys Thr Gly Thr Thr Val His Phe
165 170 175

Thr Pro Asp Pro Lys Ile Phe Thr Glu Thr Thr Ile Phe Asp Phe Asp
180 185 190

Lys Leu Asn Lys Arg Ile Gln Glu Leu Ala Phe Leu Asn Arg Gly Leu
195 200 205

Gln Ile Ser Ile Thr Asp Lys Arg Gln Gly Leu Glu Gln Thr Lys His
210 215 220

Tyr His Tyr Glu Gly Gly Ile Ala Ser Tyr Val Glu Tyr Ile Asn Glu
225 230 235 240

Asn Lys Asp Val Ile Phe Asp Thr Pro Ile Tyr Thr Asp Gly Glu Met
245 250 255

Asp Asp Ile Thr Val Glu Val Ala Met Gln Tyr Thr Thr Gly Tyr His
260 265 270

Glu Asn Val Met Ser Phe Ala Asn Asn Ile His Thr His Glu Gly Gly
275 280 285

Thr His Glu Gln Gly Phe Arg Thr Ala Leu Thr Arg Val Ile Asn Asp
290 295 300

Tyr Ala Arg Lys Asn Lys Leu Leu Lys Asp Asn Glu Asp Asn Leu Thr
305 310 315 320

Gly Glu Asp Val Arg Glu Gly Leu Thr Ala Val Ile Ser Val Lys His
325 330 335

Pro Asn Pro Gln Phe Glu Gly Gln Thr Lys Thr Lys Leu Gly Asn Ser
340 345 350

Glu Val Val Lys Ile Thr Asn Arg Leu Phe Ser Glu Ala Phe Ser Asp
355 360 365

Phe Leu Met Glu Asn Pro Gln Ile Ala Lys Arg Ile Val Glu Lys Gly
370 375 380

Ile Leu Ala Ala Lys Ala Arg Val Ala Ala Lys Arg Ala Arg Glu Val
385 390 395 400

Thr Arg Lys Lys Ser Gly Leu Glu Ile Ser Asn Leu Pro Gly Lys Leu
405 410 415

Ala Asp Cys Ser Ser Asn Asn Pro Ala Glu Thr Glu Leu Phe Ile Val
420 425 430

Glu Gly Asp Ser Ala Gly Gly Ser Ala Lys Ser Gly Arg Asn Arg Glu
435 440 445

Phe Gln Ala Ile Leu Pro Ile Arg Gly Lys Ile Leu Asn Val Glu Lys
450 455 460

Ala Ser Met Asp Lys Ile Leu Ala Asn Glu Glu Ile Arg Ser Leu Phe
465 470 475 480

Thr Ala Met Gly Thr Gly Phe Gly Ala Glu Phe Asp Val Ser Lys Ala
485 490 495

Arg Tyr Gln Lys Leu Val Leu Met Thr Asp Ala Asp Val Asp Gly Ala
500 505 510

His Ile Arg Thr Leu Leu Leu Thr Leu Ile Tyr Arg Tyr Met Lys Pro

515

520

525

Ile Leu Glu Ala Gly Tyr Val Tyr Ile Ala Gln Pro Pro Ile Tyr Gly

530

535

540

Val Lys Val Gly Ser Glu Ile Lys Glu Tyr Ile Gln Pro Gly Ala Asp

545

550

555

560

Gln Glu Ile Lys Leu Gln Glu Ala Leu Ala Arg Tyr Ser Glu Gly Arg

565

570

575

Thr Lys Pro Thr Ile Gln Arg Tyr Lys Gly Leu Gly Glu Met Asp Asp

580

585

590

His Gln Leu Trp Glu Thr Thr Met Asp Pro Glu His Arg Leu Met Ala

595

600

605

Arg Val Ser Val Asp Asp Val Gln Lys Gln Ile Lys Ser Leu Ile Cys

610

615

620

<210> 161

<211> 1446

<212> DNA

<213> Streptococcus pneumoniae

<400> 161

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 gtagggctac tcttgattat ctataaaaaa gctgaaaagt ttactatttt tctgttggtg 240
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agatga 1446

<210> 162

<211> 481

<212> PRT

<213> Streptococcus pneumoniae

<400> 162

Met Ser Arg Arg Phe Lys Lys Ser Arg Ser Gln Lys Val Lys Arg Ser
1 5 10 15

Val Asn Ile Val Leu Leu Thr Ile Tyr Leu Leu Leu Val Cys Phe Leu
20 25 30

Leu Phe Leu Ile Phe Lys Tyr Asn Ile Leu Ala Phe Arg Tyr Leu Asn
35 40 45

Leu Val Val Thr Ala Leu Val Leu Leu Val Ala Leu Val Gly Leu Leu
50 55

220

Leu Ile Ile Tyr Lys Lys Ala Glu Lys Phe Thr Ile Phe Leu Leu Val
65 70 75 80

Phe Ser Ile Leu Val Ser Ser Val Ser Leu Phe Ala Val Gln Gln Phe
85 90 95

Val Gly Leu Thr Asn Arg Leu Asn Ala Thr Ser Asn Tyr Ser Glu Tyr
100 105 110

Ser Ile Ser Val Ala Val Leu Ala Asp Ser Glu Ile Glu Asn Val Thr
115 120 125

Gln Leu Thr Ser Val Thr Ala Pro Thr Gly Thr Asn Asn Glu Asn Ile
130 135 140

Gln Lys Leu Leu Ala Asp Ile Lys Ser Ser Gln Asn Thr Asp Leu Thr
145 150 155 160

Val Asn Gln Ser Ser Tyr Leu Ala Ala Tyr Lys Ser Leu Ile Ala
165 170 175

Gly Glu Thr Lys Ala Ile Val Leu Asn Ser Val Phe Glu Asn Ile Ile
180 185 190

Glu Ser Glu Tyr Pro Asp Tyr Ala Ser Lys Ile Lys Lys Ile Tyr Thr
195 200 205

Lys Gly Phe Thr Lys Lys Val Glu Ala Pro Lys Thr Ser Lys Ser Gln
210 215 220

Ser Phe Asn Ile Tyr Val Ser Gly Ile Asp Thr Tyr Gly Pro Ile Ser
225 230 235 240

Ser Val Ser Arg Ser Asp Val Asn Ile Leu Met Thr Val Asn Arg Asp
245 250 255

Thr Lys Lys Ile Leu Leu Thr Thr Pro Arg Asp Ala Tyr Val Pro
260 265 270

Ile Ala Asp Gly Gly Asn Asn Gln Lys Asp Lys Leu Thr His Ala Gly
275 280 285

Ile Tyr Gly Val Asp Ser Ser Ile His Thr Leu Glu Asn Leu Tyr Gly
290 295 300

Val Asp Ile Asn Tyr Tyr Val Arg Leu Asn Phe Thr Ser Phe Leu Lys
305 310 315 320

Leu Ile Asp Leu Leu Gly Gly Ile Asp Val Tyr Asn Asp Gln Glu Phe
325 330 335

Thr Ala His Thr Asn Gly Lys Tyr Tyr Pro Ala Gly Asn Val His Leu
340 345 350

Asp Ser Glu Gln Ala Leu Gly Phe Val Arg Glu Arg Tyr Ser Leu Ala
355 360 365

Asp Gly Asp Arg Asp Arg Gly Arg His Gln Gln Lys Val Ile Val Ala
370 375 380

Ile Leu Gln Lys Leu Thr Ser Thr Glu Val Leu Lys Asn Tyr Ser Thr
385 390 395 400

Ile Ile Asn Ser Leu Gln Asp Ser Ile Gln Thr Asn Met Pro Leu Glu
405 410 415

Thr Met Ile Asn Leu Val Asn Ala Gln Leu Glu Ser Gly Gly Asn Tyr
420 425 430

Lys Val Asn Ser Gln Asp Leu Lys Gly Thr Gly Arg Met Asp Leu Pro
435 440 445

Ser Tyr Ala Met Pro Asp Ser Asn Leu Tyr Val Met Glu Ile Asp Asp
450 455 460

Ser Ser Leu Ala Val Val Lys Ala Ala Ile Gln Asp Val Met Glu Gly
465 470 475 480

Arg

<210> 163

<211> 732

<212> DNA

<213> Streptococcus pneumoniae

<400> 163

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732

<210> 164

<211> 243

<212> PRT

<213> Streptococcus pneumoniae

<400> 164

Met Ile Asp Ile His Ser His Ile Val Phe Asp Val Asp Asp Gly Pro

1

5

10

15

Lys Ser Arg Glu Glu Ser Lys Ala Leu Leu Ala Glu Ser Tyr Arg Gln

20

25

30

Gly Val Arg Thr Ile Val Ser Thr Ser His Arg Arg Lys Gly Met Phe
35 40 45

Glu Thr Pro Glu Glu Lys Ile Ala Glu Asn Phe Leu Gln Val Arg Glu
50 55 60

Ile Ala Lys Glu Val Ala Ser Asp Leu Val Ile Ala Tyr Gly Ala Glu
65 70 75 80

Ile Tyr Tyr Thr Pro Asp Val Leu Asp Lys Leu Glu Lys Lys Arg Ile
85 90 95

Pro Thr Leu Asn Asp Ser Arg Tyr Ala Leu Ile Glu Phe Ser Met Asn
100 105 110

Thr Pro Tyr Arg Asp Ile His Ser Ala Leu Ser Lys Ile Leu Met Leu
115 120 125

Gly Ile Thr Pro Val Ile Ala His Ile Glu Arg Tyr Asp Ala Leu Glu
130 135 140

Asn Asn Glu Lys Arg Val Arg Glu Leu Ile Asp Met Gly Cys Tyr Thr
145 150 155 160

Gln Val Asn Ser Ser His Val Leu Lys Pro Lys Leu Phe Gly Glu Arg
165 170 175

Tyr Lys Phe Met Lys Lys Arg Ala Gln Tyr Phe Leu Glu Gln Asp Leu
180 185 190

Val His Val Ile Ala Ser Asp Met His Asn Leu Asp Gly Arg Pro Pro
195 200 205

His Met Ala Glu Ala Tyr Asp Leu Val Thr Gln Lys Tyr Gly Glu Ala
210 215 220

Lys Ala Gln Glu Leu Phe Ile Asp Asn Pro Arg Lys Ile Val Met Asp
225 230 235 240

Gln Leu Ile

<210> 165

<211> 3990

<212> DNA

<213> *Streptococcus pneumoniae*

<400> 165

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 cctcaatacc tagcaagcaa aggctataaa ttcttgaata ccaacggtga ctggtactac 2760
 attcttggtc aaaaaccaga agatggggtt ggtttccctca agaaaagctat tgagaatact 2820
 ggaaaaaacac cattcaatca actagcttct accaaatatac ctgaagttaga tcttccaaca 2880
 gtcggaagta tgcttcaat ctgggcagat agaccaagcg ctgaatacaa ggaagaggaa 2940
 atcttgaac tcatgactgc ctggcagac cacaacaaag actactttcg tgctaattat 3000
 aatgctctcc gcgaagaatt agctaaaatt cctacaaact tagaaggata tagtaaagaa 3060
 agtcttggagg cccttgacgc agctaaaaca gctctaaatt acaacctcaa ccgtataaaa 3120
 caagctgagc ttgacacgc ttagccaaac ctaaaagccg ctcttcaagg cctcaaacca 3180
 gctgtaactc attcaggaag octagatgaa aatgaagtgg ctgccaatgt tgaaaccaga 3240
 ccagaactca tcacaagaac tgaagaaatt ccatttgaag ttatcaagaa agaaaatcct 3300
 aacctcccag ccggtcagga aaatattatc acagcaggag tcaaagggtga acgaactcat 3360
 tacatctctg tactcactga aaatggaaaa acaacagaaa cagtccttga tagccaggta 3420
 accaaagaag ttataaaccat agtgggtgaa gttggcgctc ctgtaactca caagggtgat 3480
 gaaaagtggtc ttgcaccaac tactgaggtt aaaccttagac tggatatcca agaagaagaa 3540
 attccattta ccacagtgc ttgtgaaaat ccacttctac tcaaaggaaa aacacaagtc 3600
 attactaagg gcgtcaatgg acatcgtagc aacttctact ctgtgagcac ttctgcccgt 3660
 ggttaaggaag tgaaaacact tgtaaatagt gtcgtagcac aggaagccgt tactcaaata 3720
 gtcgaagtcg gaactatggt aacacatgtt ggcgtatggaaa acggacaagc cgctattgt 3780
 gaagaaaaac caaaaactaga aatccccaaagc caaccagctc catcaactgc tcctgctgag 3840
 gaaagcaaag ttcttccctca agatccagct cctgtggtaa cagagaaaaa acttcctgaa 3900

acaggaactc acgattctgc aggactagta gtcgcaggac tcatgtccac actagcagcc 3960
tatggactca ctaaaagaaa agaagactaa 3990

<210> 166

<211> 1329

<212> PRT

<213> Streptococcus pneumoniae

<400> 166

Met Ile Tyr Ile Ile Ala Ile Asn Ile Thr Met Gln Ser Gly Gly Phe
1 5 10 15

Ala Met Lys His Glu Lys Gln Gln Arg Phe Ser Ile Arg Lys Tyr Ala
20 25 30

Val Gly Ala Ala Ser Val Leu Ile Gly Phe Ala Phe Gln Ala Gln Thr
35 40 45

Val Ala Ala Asp Gly Val Thr Pro Thr Thr Glu Asn Gln Pro Thr
50 55 60

Ile His Thr Val Ser Asp Ser Pro Gln Ser Ser Glu Asn Arg Thr Glu
65 70 75 80

Glu Thr Pro Lys Ala Val Leu Gln Pro Glu Ala Pro Lys Thr Val Glu
85 90 95

Thr Glu Thr Pro Ala Thr Asp Lys Val Ala Ser Leu Pro Lys Thr Glu
100 105 110

Glu Lys Pro Gln Glu Glu Val Ser Ser Thr Pro Ser Asp Lys Ala Glu
115 120 125

Val Val Thr Pro Thr Ser Ala Glu Lys Glu Thr Ala Asn Lys Lys Ala
130 135 140

Glu Glu Ala Ser Pro Lys Lys Glu Glu Ala Lys Glu Val Asp Ser Lys
145 150 155 160

Glu Ser Asn Thr Asp Lys Thr Asp Lys Asp Lys Pro Ala Lys Lys Asp
165 170 175

Glu Ala Lys Ala Glu Ala Asp Lys Pro Ala Thr Glu Ala Gly Lys Glu
180 185 190

Arg Ala Ala Thr Val Asn Glu Lys Leu Ala Lys Lys Ile Val Ser
195 200 205

Ile Asp Ala Gly Arg Lys Tyr Phe Ser Pro Glu Gln Leu Lys Glu Ile
210 215 220

Ile Asp Lys Ala Lys His Tyr Gly Tyr Thr Asp Leu His Leu Leu Val
225 230 235 240

Gly Asn Asp Gly Leu Arg Phe Met Leu Asp Asp Met Ser Ile Thr Ala
245 250 255

Asn Gly Lys Thr Tyr Ala Ser Asp Asp Val Lys Arg Ala Ile Glu Lys
260 265 270

Gly Thr Asn Asp Tyr Tyr Asn Asp Pro Asn Gly Asn His Leu Thr Glu
275 280 285

Ser Gln Met Thr Asp Leu Ile Asn Tyr Ala Lys Asp Lys Gly Ile Gly
290 295 300

Leu Ile Pro Thr Val Asn Ser Pro Gly His Met Asp Ala Ile Leu Asn
305 310 315 320

Ala Met Lys Glu Leu Gly Ile Gln Asn Pro Asn Phe Ser Tyr Phe Gly
325 330 335

Lys Lys Ser Ala Arg Thr Val Asp Leu Asp Asn Glu Gln Ala Val Ala
340 345 350

Phe Thr Lys Ala Leu Ile Asp Lys Tyr Ala Ala Tyr Phe Ala Lys Lys
355 360 365

Thr Glu Ile Phe Asn Ile Gly Leu Asp Glu Tyr Ala Asn Asp Ala Thr
370 375 380

Asp Ala Lys Gly Trp Ser Val Leu Gln Ala Asp Lys Tyr Tyr Pro Asn
385 390 395 400

Glu Gly Tyr Pro Val Lys Gly Tyr Glu Lys Phe Ile Ala Tyr Ala Asn
405 410 415

Asp Leu Ala Arg Ile Val Lys Ser His Gly Leu Lys Pro Met Ala Phe
420 425 430

Asn Asp Gly Ile Tyr Tyr Asn Ser Asp Thr Ser Phe Gly Ser Phe Asp
435 440 445

Lys Asp Ile Ile Val Ser Met Trp Thr Gly Gly Trp Gly Gly Tyr Asp
450 455 460

Val Ala Ser Ser Lys Leu Leu Ala Glu Lys Gly His Gln Ile Leu Asn
465 470 475 480

Thr Asn Asp Ala Trp Tyr Tyr Val Leu Gly Arg Asn Ala Asp Gly Gln
485 490 495

Gly Trp Tyr Asn Leu Asp Gln Gly Leu Asn Gly Ile Lys Asn Thr Pro
500 505 510

Ile Thr Ser Val Pro Lys Thr Glu Gly Ala Asp Ile Pro Ile Ile Gly
515 520 525

Gly Met Val Ala Ala Trp Ala Asp Thr Pro Ser Ala Arg Tyr Ser Pro
530 535 540

Ser Arg Leu Phe Lys Leu Met Arg His Phe Ala Asn Ala Asn Ala Glu
545 550 555 560

Tyr Phe Ala Ala Asp Tyr Glu Ser Ala Glu Gln Ala Leu Asn Glu Val
565 570 575

Pro Lys Asp Leu Asn Arg Tyr Thr Ala Glu Ser Val Thr Ala Val Lys
580 585 590

Glu Ala Glu Lys Ala Ile Arg Ser Leu Asp Ser Asn Leu Ser Arg Ala
595 600 605

Gln Gln Asp Thr Ile Asp Gln Ala Ile Ala Lys Leu Gln Glu Thr Val
610 615 620

Asn Asn Leu Thr Leu Thr Pro Glu Ala Gln Lys Glu Glu Glu Ala Lys
625 630 635 640

Arg Glu Val Glu Lys Leu Ala Lys Asn Lys Val Ile Ser Ile Asp Ala
645 650 655

Gly Arg Lys Tyr Phe Thr Leu Asn Gln Leu Lys Arg Ile Val Asp Lys
660 665 670

Ala Ser Glu Leu Gly Tyr Ser Asp Val His Leu Leu Leu Gly Asn Asp
675 680 685

Gly Leu Arg Phe Leu Leu Asp Asp Met Thr Ile Thr Ala Asn Gly Lys
690 695 700

Thr Tyr Ala Ser Asp Asp Val Lys Lys Ala Ile Ile Glu Gly Thr Lys
705 710 715 720

Ala Tyr Tyr Asp Asp Pro Asn Gly Thr Ala Leu Thr Gln Ala Glu Val
725 730 735

Thr Glu Leu Ile Glu Tyr Ala Lys Ser Lys Asp Ile Gly Leu Ile Pro
740 745 750

Ala Ile Asn Ser Pro Gly His Met Asp Ala Met Leu Val Ala Met Glu
755 760 765

Lys Leu Gly Ile Lys Asn Pro Gln Ala His Phe Asp Lys Val Ser Lys
770 775 780

Thr Thr Met Asp Leu Lys Asn Glu Glu Ala Met Asn Phe Val Lys Ala
785 790 795 800

Leu Ile Gly Lys Tyr Met Asp Phe Phe Ala Gly Lys Thr Lys Ile Phe
805 810 815

Asn Phe Gly Thr Asp Glu Tyr Ala Asn Asp Ala Thr Ser Ala Gln Gly
820 825 830

Trp Tyr Tyr Leu Lys Trp Tyr Gln Leu Tyr Gly Lys Phe Ala Glu Tyr
835 840 845

Ala Asn Thr Leu Ala Ala Met Ala Lys Glu Arg Gly Leu Gln Pro Met
850 855 860

Ala Phe Asn Asp Gly Phe Tyr Tyr Glu Asp Lys Asp Asp Val Gln Phe
865 870 875 880

Asp Lys Asp Val Leu Ile Ser Tyr Trp Ser Lys Gly Trp Trp Gly Tyr
885 890 895

Asn Leu Ala Ser Pro Gln Tyr Leu Ala Ser Lys Gly Tyr Lys Phe Leu
900 905 910

Asn Thr Asn Gly Asp Trp Tyr Tyr Ile Leu Gly Gln Lys Pro Glu Asp
915 920 925

Gly Gly Gly Phe Leu Lys Lys Ala Ile Glu Asn Thr Gly Lys Thr Pro
930 935 940

Phe Asn Gln Leu Ala Ser Thr Lys Tyr Pro Glu Val Asp Leu Pro Thr
945 950 955 960

Val Gly Ser Met Leu Ser Ile Trp Ala Asp Arg Pro Ser Ala Glu Tyr
965 970 975

Lys Glu Glu Glu Ile Phe Glu Leu Met Thr Ala Phe Ala Asp His Asn
980 985 990

Lys Asp Tyr Phe Arg Ala Asn Tyr Asn Ala Leu Arg Glu Glu Leu Ala
995 1000 1005

Lys Ile Pro Thr Asn Leu Glu Gly Tyr Ser Lys Glu Ser Leu Glu Ala
1010 1015 1020

Leu Asp Ala Ala Lys Thr Ala Leu Asn Tyr Asn Leu Asn Arg Asn Lys
1025 1030 1035 1040

Gln Ala Glu Leu Asp Thr Leu Val Ala Asn Leu Lys Ala Ala Leu Gln
1045 1050 1055

Gly Leu Lys Pro Ala Val Thr His Ser Gly Ser Leu Asp Glu Asn Glu
1060 1065 1070

Val Ala Ala Asn Val Glu Thr Arg Pro Glu Leu Ile Thr Arg Thr Glu
1075 1080 1085

Glu Ile Pro Phe Glu Val Ile Lys Lys Glu Asn Pro Asn Leu Pro Ala
1090 1095 1100

Gly Gln Glu Asn Ile Ile Thr Ala Gly Val Lys Gly Glu Arg Thr His
1105 1110 1115 1120

Tyr Ile Ser Val Leu Thr Glu Asn Gly Lys Thr Thr Glu Thr Val Leu
1125 1130 1135

Asp Ser Gln Val Thr Lys Glu Val Ile Asn Gln Val Val Glu Val Gly
1140 1145 1150

Ala Pro Val Thr His Lys Gly Asp Glu Ser Gly Leu Ala Pro Thr Thr
1155 1160 1165

Glu Val Lys Pro Arg Leu Asp Ile Gln Glu Glu Glu Ile Pro Phe Thr
1170 1175 1180

Thr Val Thr Cys Glu Asn Pro Leu Leu Leu Lys Gly Lys Thr Gln Val
 1185 1190 1195 1200

Ile Thr Lys Gly Val Asn Gly His Arg Ser Asn Phe Tyr Ser Val Ser
 1205 1210 1215

Thr Ser Ala Asp Gly Lys Glu Val Lys Thr Leu Val Asn Ser Val Val
 1220 1225 1230

Ala Gln Glu Ala Val Thr Gln Ile Val Glu Val Gly Thr Met Val Thr
 1235 1240 1245

His Val Gly Asp Glu Asn Gly Gln Ala Ala Ile Ala Glu Glu Lys Pro
 1250 1255 1260

Lys Leu Glu Ile Pro Ser Gln Pro Ala Pro Ser Thr Ala Pro Ala Glu
 1265 1270 1275 1280

Glu Ser Lys Val Leu Pro Gln Asp Pro Ala Pro Val Val Thr Glu Lys
 1285 1290 1295

Lys Leu Pro Glu Thr Gly Thr His Asp Ser Ala Gly Leu Val Val Ala
 1300 1305 1310

Gly Leu Met Ser Thr Leu Ala Ala Tyr Gly Leu Thr Lys Arg Lys Glu
 1315 1320 1325

Asp

<210> 167

<211> 825

<212> DNA

<213> Streptococcus pneumoniae

<400> 167

atgaacaaaa aaacaagaca gacactaattt ggactgcttag ttttattgtt ttttgttaca 60
 gggagctatt atatcaagca gatgccgtcg gcacctaata gtcccaaaac caatcttagt 120
 cagaaaaaac aagcgtctga agtccttagt caaggattgg cagagagtgt cttaacagac 180

gcagtcaaga gtcaaataaa ggggagtcgt gagtggaaatg gctcagggtgc ttttatcg 240
 aatggtaata aaacaaatct agatgccaag gtttcaagta agccctacgc tgacaataaa 300
 acaaagacag tggcaagga aactgttcca accgttagcta atgccttgcgt gcttaaggcc 360
 actcgtcagt acaagaatcg taaagaaact ggaaatggtt caacttcttg gactcctcca 420
 gttggcattc aggtcaagaa tctaaaggcc tcttataccct atgcagtcga tagaggtcat 480
 ttgttaggct atgccttaat cggtggtttg gatggtttg atgcctcaac aagcaatcct 540
 aaaaacatttgc tggcagac agcctggca aatcaggcac aagccgagta ttgcactgg 600
 caaaaactact atgaaagcaa ggtgcgtaaa gccttggacc aaaacaagcg tgtccgttac 660
 cgtgttaaccc ttactacgc ttcaaaccgag gatttagttc cctcagcttc acagattgaa 720
 gccaagtctt cggatggaga attgaaatttcaatgttccatgt tc当地aaaggaa 780
 ctcaactgg attaccgaac tggagaagta actgttaactc agtaa 825

<210> 168

<211> 274

<212> PRT

<213> Streptococcus pneumoniae

<400> 168

Met Asn Lys Lys Thr Arg Gln Thr Leu Ile Gly Leu Leu Val Leu Leu			
1	5	10	15

Leu Leu Ser Thr Gly Ser Tyr Tyr Ile Lys Gln Met Pro Ser Ala Pro			
20	25	30	

Asn Ser Pro Lys Thr Asn Leu Ser Gln Lys Lys Gln Ala Ser Glu Ala			
35	40	45	

Pro Ser Gln Ala Leu Ala Glu Ser Val Leu Thr Asp Ala Val Lys Ser			
50	55	60	

Gln Ile Lys Gly Ser Leu Glu Trp Asn Gly Ser Gly Ala Phe Ile Val			
65	70	75	80

Asn Gly Asn Lys Thr Asn Leu Asp Ala Lys Val Ser Ser Lys Pro Tyr			
85	90	95	

Ala Asp Asn Lys Thr Lys Thr Val Gly Lys Glu Thr Val Pro Thr Val
100 105 110

Ala Asn Ala Leu Leu Ser Lys Ala Thr Arg Gln Tyr Lys Asn Arg Lys
115 120 125

Glu Thr Gly Asn Gly Ser Thr Ser Trp Thr Pro Pro Gly Trp His Gln
130 135 140

Val Lys Asn Leu Lys Gly Ser Tyr Thr His Ala Val Asp Arg Gly His
145 150 155 160

Leu Leu Gly Tyr Ala Leu Ile Gly Gly Leu Asp Gly Phe Asp Ala Ser
165 170 175

Thr Ser Asn Pro Lys Asn Ile Ala Val Gln Thr Ala Trp Ala Asn Gln
180 185 190

Ala Gln Ala Glu Tyr Ser Thr Gly Gln Asn Tyr Tyr Glu Ser Lys Val
195 200 205

Arg Lys Ala Leu Asp Gln Asn Lys Arg Val Arg Tyr Arg Val Thr Leu
210 215 220

Tyr Tyr Ala Ser Asn Glu Asp Leu Val Pro Ser Ala Ser Gln Ile Glu
225 230 235 240

Ala Lys Ser Ser Asp Gly Glu Leu Glu Phe Asn Val Leu Val Pro Asn
245 250 255

Val Gln Lys Gly Leu Gln Leu Asp Tyr Arg Thr Gly Glu Val Thr Val
260 265 270

Thr Gln

<210> 169

<211> 225

<212> DNA

<213> Streptococcus pneumoniae

<400> 169

tgcttaagat tcagccgatt gaggcaagt atgaagatga ataagaaatc aagctacgta 60
gtcaagcggt tacttttagt catcatagta ctgattttag gtactctggc tctaggaatc 120
ggttaatgg taggttatgg aatcttgggc aagggtcaag atccatgggc tatcctgtct 180
ccagcaaaat ggcaggaatt gattcataaa tttacagga attag 225

<210> 170

<211> 74

<212> PRT

<213> Streptococcus pneumoniae

<400> 170

Val Leu Arg Phe Ser Gly Leu Arg Gln Val Met Lys Met Asn Lys Lys
1 5 10 15

Ser Ser Tyr Val Val Lys Arg Leu Leu Leu Val Ile Ile Val Leu Ile
20 25 30

Leu Gly Thr Leu Ala Leu Gly Ile Gly Leu Met Val Gly Tyr Gly Ile
35 40 45

Leu Gly Lys Gly Gln Asp Pro Trp Ala Ile Leu Ser Pro Ala Lys Trp
50 55 60

Gln Glu Leu Ile His Lys Phe Thr Gly Asn
65 70

<210> 171

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 171

cgagatctga tatctcacaa acagataacg gcgtaaatag

40

<210> 172

<211> 43

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 172

gaagatcttc cccgggatca caaacagata acggcgtaaa tag

43

<210> 173

<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 173

cgagatctga tatccatcac aaacagataa cggcgtaaat ag

42

<210> 174

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 174

cgggatcctt atggacctga atcagcgttg tc

32

<210> 175

<211> 23

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 175

ggatgcgttg tttcaggtgt atc

23

<210> 176

<211> 82

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 176

catgatatcg gtacctaag ctcataatcat tgtccggcaa tggtgtggc tttttttgtt 60

ttagcggata acaatttcac ac

82

<210> 177

<211> 81

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 177

gcggatcccc cgggcttaat taatgtttaa acactagtcg aagatctcg 60
gtgtgaaatt gttatccgct a 81

<210> 178

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 178

cgccagggtt ttcccagtca cgac 24

<210> 179

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 179

tcaggggggc ggagcctatg 20

<210> 180

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 180

tctgtatgttg tgtgaaattg tg 22

<210> 181
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 181
tccggctcgt atgttgtgtg gaattg

26

<210> 182
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<221> SITE
<222> (3)
<223> Xaa=Any amino acid

<220>
<223> Description of Artificial Sequence: Cell wall
anchoring motif

<400> 182
Leu Pro Xaa Thr Gly
1 5

<210> 183
<211> 18
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 183

gcgggatccg ccaccatg 18

<210> 184

<211> 10

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 184

ttgcggccgc 10

<210> 185

<211> 43

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 185

cgatccgcc accatgggtc taattgaaga cttaaaaaat caa 43

<210> 186

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 186

ttgcggccgc caatgctaga ctaaacacaa gactca

36

<210> 187

<211> 36

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 187

cgcggatcca tgaaaaaaaaat ctattcattt ttagca

36

<210> 188

<211> 38

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 188

ccctcgaggg ctacttccga tacatTTAA actgttagg

38

<210> 189

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer

<400> 189

cggatccgcc accatgagtc atgtcgctgc aaatg

35

<210> 190
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 190
ttgcggccgc ataccaaacg ctgacatcta cg

32

<210> 191
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 191
cgatatccgcc accatgcaaa aagagcggta tggttatg

38

<210> 192
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 192
ttgcggccgc acccccattc ttaatccctt

30

<210> 193
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 193
cggatccgccc accatggagg tatgtgaaat gtcacgtaaa

40

<210> 194
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 194
ttgcggccgc ttttacaaag tcaagcaaag cc

32

<210> 195
<211> 48
<212> PRT
<213> Streptococcus pneumoniae

<400> 195
Gly Ile Arg Leu Arg Asn Met Leu Phe Lys Ile Trp Pro Ala Val Ala
1 5 10 15

Leu Val Thr Ser Ser Gly Asn Asn Val Ser Met Leu His Ser Ile Ala
20 25 30

Asn Met Gly Gln Leu Thr Leu Gly Thr Gln Cys Gln Thr Val Val Val
35 40 45

<210> 196

<211> 11

<212> PRT

<213> Streptococcus pneumoniae

<400> 196

Gln Lys Ile Thr Met Ile Thr Phe Thr Phe Gln

1

5

10